Resilience Profiles and Postpartum Depression in Low-Income Mexican American Women

by

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ABSTRACT

The primary aim of this study was to investigate resilient profiles in low-income Mexican American (MA) mothers. MA mothers are part of an under researched population, the fastest growing ethnic minority group, and have the highest birth rate in the United States, presenting a significant public health concern. The transition to motherhood can be an emotionally and physically complex time for women, particularly in the context of a stressful low-income environment. Although most low-income women navigate this transition well, a significant number of mothers develop moderate to severe depressive symptoms. The proposed research investigated profiles of resilience during the prenatal period using a person-centered approach via latent profile analysis. In alignment with current resilience theories, several domains of resilience were investigated including psychological, social, and cultural adherence (e.g,. maintaining specific cultural traditions). Concurrent prenatal depressive symptoms and stress were correlated with the profiles in order to establish validity. Six week postpartum depressive symptoms and physiological processes (e.g., overall cortisol output, heart rate variability, and sleep) were also predicted by the prenatal resilient profiles. The resulting data revealed three separate profiles: low-resource, high-resource Anglo, and high-resource Mexican. These resilience profiles had differential associations with concurrent depressive symptoms and stress, such that women in the high-resource profiles reported less depressive symptoms and stress prenatally. Further, profile differences regarding cortisol output, resting heart rate variability, were also found, but there were no differences in insomnia symptoms. Profile classification also moderated the effects of prenatal economic stress on postpartum depressive symptoms, such that women in the high-resource Mexican profile were at risk for higher postpartum depressive symptoms under high economic stress compared to the high-resource Anglo group, which demonstrated a more resilient

response. Overall, the results suggest the presence of multiple clusters of prenatal resilience within a sample of MA mothers facing health disparities, with various effects on perinatal mental health and postpartum physiological processes. The results also highlight the need for multi-dimensional models of resilience and the possible implications for interventions.

DEDICATION

This project is dedicated to my father who has always encouraged me to never stop dreaming. His "secrets of life," pep talks, and encouragement have sustained me through many successes and pitfalls. I am also grateful to my mother who has taught me the value of patience and importance of determination, and to my brothers who are my biggest cheerleaders and a source of pure happiness in my life. I am also eternally thankful for the unwavering support of my husband. He has been my rock, partner, sounding board, and confidant. I am grateful for the life we have built and that he can share in this accomplishment with me. Throughout graduate school, my friends' advice and support have been a critical part of my development and success. I do not know what I would have done without all of the laughter and memories we have shared together over the past several years. Lastly, my research and imagination is constantly inspired by my daughter, Josephine, who is my definition of resilience and source of endless love. I dedicate this to her in hopes she will also strive to achieve all of her dreams.

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INTRODUCTION

Overview

The transition to motherhood can be a complex emotional and physical time for women. Postpartum depression is one significant adversity that can be experienced during this critical period, as a mother adapts to and bonds with her infant. Research has indicated that postpartum depression can have negative effects on both mother and infant, including poor maternal physical and long-term mental health (Da Costa, Dritsa, Rippen, Lowensteyn, & Khalife, 2006) and problematic cognitive, physiological, behavioral, and emotional consequences for the infant (Dawson, Panagiotides, Klinger, & Spieker, 1997; Field, 1995; Murray & Cooper, 1997) that may extend into childhood or beyond (Bornstein, 1989). Studies have found that 13-19% of women experience postpartum depression in the majority culture (O'Hara & McCabe, 2013); however, additional risk factors are associated with even higher prevalence rates of postpartum depression in other samples of minority women. Hispanic American women may be at particular risk for postpartum depression, as they are more likely to be exposed to risk factors, including poverty, low levels of education, and a lack of health insurance (Ramirez & de la Cruz, 2002). Significantly increased rates of postpartum depression have been found in this high-risk population during the early postpartum period (4-6 weeks), ranging from 21-53% (Beck, Froman, & Bernal, 2005; Davila, McFall, & Cheng, 2009; Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2011; Heilemann, Lee, & Kury, 2002; Martinez-Schallmoser, Telleen, & MacMullen, 2003). Latinos comprised more than half of the growth of the total United States population from 2000-2010 (Ennis, Rios-Vargas, &

Albert, 2011). Moreover, Mexican Americans constitute 58.5% of all Hispanics (Ennis, Rios-Vargas, & Albert, 2011) and have the highest birth rate (Martin, Hamilton, Ventura, Osterman, Wilson, & Matthews, 2012), creating a large public health impact for a substantial and continuously growing population.

Given the increased prevalence and greater number of risk factors for Mexican American mothers and children, the importance of fully understanding postpartum depression cannot be understated. Generally, research has focused on the negative outcomes and risk factors associated with postpartum depression (Dennis, Janssen, & Singer, 2004). Few studies have examined the mechanisms that account for why some women in the same high risk environment do not develop postpartum depression. Such an approach would be aligned with resilience theory, which is broadly defined as the processes that promote well-being and adaption in the face of adversity and stress (Rutter, 1987). Additional knowledge in this area may help explicate the pathways toward, and recovery from, postpartum depression in this high risk population. Only two studies have examined models of intrinsic protective factors that buffer the effects of postpartum depression in Mexican-American mothers. These two studies found that protective factors (e.g. acculturation) were more associated with postpartum depression compared to traditional demographic predictors (Heilemann, Frutos, Lee, & Kury, 2004; Heilemann, Lee, & Kury, 2002). However, there is still a need for a comprehensive and integrative model of resilience processes during the transition to motherhood.

The purpose of this study is to propose a model of prenatal resilient profiles utilizing three separate facets of resilience: social, psychological, and cultural adherence. After a general discussion of resilience theory and its application to postpartum

depression, the specific facets of social, cultural, and psychological resilience will be discussed. Each of these three areas have been researched individually, but not as a cohesive model of resilience. Recent resilience theorists have emphasized the importance of examining biological aspects of resilience (Curtis & Cicchetti, 2003). The lack of prenatal biological measures in the current study prohibits the inclusion of physiological measures into the resilience model; however, biological correlates (including total cortisol output, sleep, and heart rate variability) at six weeks postpartum will be investigated as biological outcomes associated with prenatal resilience profiles. Lastly, how the resilience profiles relate to the occurrence of depressive symptoms and stress prenatally and in the early postpartum period will also be discussed (see Figure 1).

Resilience Theory

The term resilience has been used in multiple contexts and measured in a variety of ways. The origins of resilience theory were primarily grounded in developmental research (Luthar, Sawyer, & Brown, 2006; Masten, 2007); however, it has been recently applied to other areas, including chronic pain (Smith & Zautra, 2008), cancer (Ho, Ho, Bonanno, Chu, & Chan, 2010), depression, anxiety, or stress (Southwick, Vythilingam, & Charney, 2005), and the effects of adverse childhood events in adulthood (Wingo, Wrenn, Pelleteir, Gutman, Bradley, & Ressler, 2010).

Although resilience theory has been applied broadly, there a debate remains regarding the actual definition and measurement of resilience and whether it is a unique construct (Masten, 2007). For example, many studies use a singular construct (e.g. self-esteem or social competence) as the only marker for resilience, or do not directly measure it at all, instead inferring it from scores on the measures (Luthar & Zelazo, 2003). This

use of singular measurements significantly narrows the scope of resilience, which involves intricate and complex pathways involving psychological, social, and physiological components. Recent research, and this proposal, defines resilience as external and internal processes that promote protection and recovery from negative mental and physical health outcomes during stressful events and life transitions (e.g. Sturgeon & Zautra, 2010). Current research findings also indicate that being resilient does not necessarily mean that one is impervious to the negative impact of adversity (e.g. depression), but rather a person with resilient resources is able to cope and recover from negative life events (Fergus & Zimmerman, 2005; Masten, 2007; Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003; Rutter, 2007; Werner, 2005).

Current models of resilience have suggested a multi-dimensional resource based approach. Intellectual, social, physical, and psychological resources serve as reserves that can be drawn on later to improve the odds of successful coping and survival during times of stress (Fredrickson, 2004). Work by Gallo and Matthews (2003) presents the idea of "reserve capacity." The concept of reserve capacity refers to a particular environmental context (e.g., low socioeconomic status) that is likely to be stressful, and can lead to more negative cognitions, decreased psychosocial resources, and inability to build up "resource reserves." The reserve capacity model also applies to adverse situations such as postpartum depression. For instance, postpartum depression could be considered the environmental context that leads to maladaptive cognitive, social, and emotional consequences. Other studies have suggested that the measurement of resilience needs to start with multiple domains that constitute a person's 'resource reserves' (Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003). Taken together, these theories and models

present compelling evidence for a multi-dimensional model of resilience capacity that integrates intrinsic, extrinsic factors, and multiple levels of analysis (Cicchetti & Curtis, 2007).

Specifically examining women's psychosocial development, the prenatal and postpartum periods are important and distinctive markers in a woman's life. In general, "turning points" are opportune junctures to study resilience processes, because resilience resources are utilized (Rutter, 1987). The prenatal period is an ideal time period to examine resilience processes in mothers and possible psychological and biological correlates that may affect the overall quality of the mother-infant relationship. However, very little research addressing multiple levels of resilience during this time period has been conducted. Psychological, social, and cultural domains of resilience may be especially relevant for Mexican American mothers and require further examination within a comprehensive framework. The current proposal suggests these three domains of resilience operate as resilience profiles (see Figure 1). Resources from these profiles would be utilized during the stressors inherent with the transition to motherhood during the postpartum period.

Psychological Resources

Psychological facets of resilience have been one of the more heavily researched areas in the literature (Cicchetti & Curtis, 2007). Numerous psychological variables have been associated with individuals overcoming adversity; however, in the context of new motherhood, dimensions such as personal mastery and various coping strategies may be particularly useful. For this model, these concepts pertain to a global feeling of control in

a stressful situation or adversity. These constructs lay a foundation for a broad model of psychological resources in new mothers.

Control beliefs: personal mastery & coping. Control beliefs and mastery have been broadly defined as an individual's ability to control or influence outcomes and stress (Pearlin & Schooler, 1978). Control beliefs have also been investigated as an aspect of resilience (Lin, Sandler, Ayers, Wolchik, & Luecken, 2004) and in low SES populations (Mirowsky & Ross, 1986). Additionally, personal mastery has predicted better mental and physical health (Shapiro, Schwartz, & Astin, 1996) in general adult populations. Within prenatal and postpartum samples, personal mastery has also been linked to engaging in prenatal healthcare (Reisch & Tinsley, 1994), a decrease in prenatal anxiety (Gurung, Dunkel Schetter, Collins, Rini, & Hobel, 2005), and childbirth satisfaction (Humenick & Bugen, 1981). Even though mastery has been investigated in conjunction with several aspects of the pregnancy and postpartum periods, only one study was found to examine mastery and postpartum depression, which indicated a decrease in depressive symptoms in Mexican American mothers with higher levels of personal mastery (Heilemann, Frutos, Lee, & Kury, 2004).

Several studies have found a significant association between coping strategies (e.g. active coping), resilience, and health (Campbell-Sills, Cohan, & Stein, 2006; Gress, Luecken, & Sandler, 2010). However, methods of coping during pregnancy and postpartum periods have received little attention, and have been identified as an area needing research (Dunkel Schetter, 2011). The limited studies that have been conducted suggest that certain types of coping, such as emotion- and problem-focused strategies, were associated with less distress during pregnancy (Huizink, de Medina, Mulder, Visser,

& Buitelaar, 2002). Further, the examination of coping within low-income, ethnic women is poorly understood. Cameron, Wells, & Hobfoll (1996) suggest that seeking social support is an important facet of coping that is often considered less adaptive than problem-focused coping, but is a very important coping mechanism in low-income, ethnic women. Demyttenaere, Lenaerts, Nijs, & Van Assche (1995), found that women who had lower social support coping were also more likely to evaluate their partner's support as insufficient. Dissatisfaction with partner support was then related to postpartum depressive symptoms at six months postpartum. However, this study did not test a relation between social support coping and depressive symptoms directly, nor did it examine associations between other coping mechanisms (e.g. problem solving) and depressive symptoms. How various coping strategies operate within low-income Mexican American women during the prenatal period is still relatively unknown. Given the limited literature available, seeking social support and planful problem solving may be promising pathways to explore.

Social Resources

Transitioning from individual-level factors to a broader dimension of resilience mechanisms, social facets have very important implications for a multilevel resilience model, particularly in the context of pregnancy and postpartum periods. Relationships have been referred to as the foundation of resilience (Luthar, Sawyer, & Brown, 2006). In Mexican American mothers, social support has also been shown to be associated with increased participation in prenatal care (Luecken, Purdom, & Howe, 2009; Zambrana, Scrimshaw, Collins, & Dunkel-Schetter, 1997) and better birth outcomes in Mexican American infants (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1995; Sherraden &

Barrera, 1996), making it an essential aspect of resilience to assess in this population. In relation to postpartum depression, Martinez-Schallmoser, MacMullen, and Telleen (2005) suggest that social support for Mexican American mothers is most beneficial if it fulfills three main needs: emotional support, positive social interactions, and instrumental support (e.g. financial assistance and help with daily tasks). Support from the baby's father and maternal family have been identified as two primary sources of social support where these needs are commonly fulfilled; however, studies have also investigated more general measures of support. Conversely, the lack of social support has been implicated as an important factor for the development of postpartum depression in Mexican American and Latina mothers (Beck, 2001; Martinez-Schallmoser, Telleen, & MacMullen, 2003; Neter, Collins, Lobel, & Dunkel-Schetter, 1995; Sheng, Le, & Perry, 2010; Zambrana, Scrimshaw, Collins, & Dukel-Schetter, 1997). Because support from the baby's father, family support, and other types of support may contribute to protection from postpartum depression, each of these aspects of social support will be integrated into the model of resilience presented here (see Figure 1).

Paternal support. Several studies have investigated the role of paternal support and the development of postpartum depression in low-income Hispanic mothers. Fathers have been shown to be the 'major provider' of support during and after pregnancy in Latina populations (Neter, Collins, Lobel, & Dunkel-Schetter, 1995; Zayas & Busch-Rossnagel, 1992). Paternal support during pregnancy has been significantly associated with more favorable views of pregnancy (from the mother) and lower levels of prenatal stress and substance use (Zambrana, Scrimshaw, Collins, & Dukel-Schetter, 1997). Additionally, perceived satisfaction with paternal support both prenatally and four weeks

postpartum was correlated with postpartum depression in women who were categorized as high risk (i.e. had significant levels of depressive symptoms prenatally; Sheng, Le, & Perry, 2010). In contrast, in the same study, global, family, and support from others were only significant cross-sectionally in the postpartum period. Further illustrating the unique contribution of paternal support as a risk factor for postpartum depression, one study found that women who were dissatisfied with the level of support received from the baby's father were at greater risk for developing postpartum depression at six to eight weeks postpartum (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1995).

Although there is substantial research indicating that parental support is important to maternal outcomes, some studies have also shown inconsistent results. For example, Neter, Collins, Lobel, & Dunkel-Schetter (1995) found that even when the baby's father was the primary source of emotional support, paternal support was not a significant predictor of postpartum depression. The authors note this may be due to measurement error, but also suggest that "material, instrumental, and informational" support were procured through family members and friends, not the father. This may have been a function of a significant proportion of the sample being unmarried, and therefore unable to rely on paternal support. Thus, although paternal support is important to measure, other types of support need to be considered as well.

Family support. Support deriving from family resources is an important cultural consideration for Mexican American mothers (Martinez-Schallmoser, Telleen, & MacMullen, 2003). Sherraden and Barrera (1996) found that in a sample of Mexican immigrant women 59% shared housing or living space with extended family or close friends. Additionally, among women who did not reside with family members, many had

relatives within ten minutes from their home. This may lead to a close emotional network and sources of potential financial or instrumental support that are easily accessible. Sherraden and Barrera (1996) also found that a woman's mother is particularly important for advice and support during the postpartum period. However, there are some conflicting results regarding the utility of prenatal family support and postpartum depression. In Latina mothers, one study found an association between perceived family support and decreased depressive symptoms during the postpartum period. There was not a significant relation between perceived family support and depressive symptoms prenatally (Sheng, Le, & Perry, 2010). Given the emphasis on family as a primary source of support for Latina populations (Clark, 2001; Knight et al, 2010), family support is likely an important mechanism for Mexican American mothers; however, the majority of studies examine social support as a global construct rather than parsing apart various sources of support during the prenatal and postpartum periods separately, resulting in a gap in the current literature.

General social support. Several studies examining social support in low-income Mexican American mothers have focused on global social support, network size, or general support regardless of the source. Close friends or neighbors can often become included in an "extended family network" and carry out informal tasks such as baby sitting, giving advice, or becoming role models to children (Martinez-Schallmoser, MacMullen, & Telleen, 2005). Perceived social support during the late prenatal period from these more informal networks has also been associated with lower levels of postpartum depression at 6 and 8 weeks postpartum (Martinez-Schallmoser, Telleen, & MacMullen, 2003; Neter, Collins, Lobel, & Dunkel-Schetter 1995) and cross-sectionally

during the early postpartum period (Sheng, Le, & Perry, 2010). In a sample of low SES women, those with high levels of stressful life events prenatally, and received high levels of social support, were less likely to experience depression at eight weeks postpartum than those with lower levels of support (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1995). These studies included instrumental or material needs in their model of global social support, but few studies have combined paternal, familial, and global components of social support in one model of social support in postpartum mothers. The current study will contribute to the current literature by considering multiple components of social resources.

Cultural adherence: Traditionalism in Hispanic culture

The broader context of cultural traditions must be considered when discussing a comprehensive model of resilience in Mexican American mothers. Ungar (2010) has emphasized that the definition of resilience must include culture and context when investigating resilience factors that promote "health-sustaining resources." Additionally, Castro & Murray (2010) discuss the bidirectional effects of acculturation and resilience, suggesting that an individual does not need to exclusively belong to one culture or another, but could adopt a bicultural identity over time. Forming and maintaining a bicultural identity or competence has also been termed "cultural flex"(Castro & Murray, 2010), where an individual is able to transition between the majority and minority cultures, which may ultimately lead to better psychological and emotional outcomes. Gonzales, Knight, Morgan-Lopez, Saenz, & Sirolli (2002) also emphasizes that cultural identity is a multi-faceted, dynamic process that undergoes changes during major life changes, possibly including the transition into motherhood. To date, there are no existing

models of cultural resilience specific to this population; however, broader models of cultural resilience have been proposed (Berry, 2003; Castro & Murray, 2010).

For the purpose of this model, cultural resilience is conceptualized as adherence to traditional cultural beliefs and practices and thus termed 'cultural adherence.' Studies have shown that engaging in cultural traditions is associated with lower levels of depressive symptoms in Mexican American mothers (Martinez-Schallmoser, Telleen, & MacMullen, 2003). Within the broader model presented in this study, one possible resilient pathway may include biculturalism, or a high degree of cultural flex. For example, a woman who utilizes aspects of both American and Mexican American culture would have a strong sense of cultural adherence and be able to successfully negotiate individual psychological resilient processes that may be aligned with American culture (e.g. personal mastery). Bicultural flexibility has been theorized as a protective approach during pregnancy in Mexican American women (Lagana, 2003). To appropriately measure culture, current research has suggested that multiple measurements should be used (Hunt, 2004). Therefore, 'cultural adherence' will include measures of acculturation, familism, and traditional postpartum practices.

Acculturation. Over the past several decades, the concepts of acculturation and the Hispanic Paradox have emerged in research with Hispanic populations. Acculturation is defined as the transition of one's home culture to the culture of a host country (Escobar, Constanza, & Gara, 2000). The Hispanic Paradox refers to the phenomenon that Hispanics tend to have better physical and mental health outcomes compared to the majority culture despite exposure to known risk factors, such as low education, low SES and decreased access to healthcare (Lara, Gamboa, Kahramanian, Morales, & Bautista,

2005). Likewise, the Latina Paradox refers specifically to positive birth outcomes in the context of these same risk factors (McGlade, Saha, & Dahlstrom, 2004).

High levels of acculturation (i.e. becoming more "Americanized") have been related to poor birth outcomes, higher levels of prenatal stress, increased isolation (Martinez-Schallmoser, Telleen, & MacMullen, 2003) and later initiation of prenatal care in women of Mexican origin (Luecken, Purdom, & Howe, 2009; Zambrana, Scrimshaw, Collins, & Dunkel-Schetter, 1997). Despite the compelling evidence linking acculturation and maternal outcomes, few studies specifically examining the relation between acculturation and postpartum depression have been conducted. Two studies have found a significant positive association between acculturation and depressive symptoms in pregnant and postpartum Latinas, where acculturation was measured as birth country and language (Davila, McFall, & Cheng, 2009), low use of Spanish language (Martinez-Schallmoser, Telleen, & MacMullen, 2003), or a childhood spent in the host country (Heilemann, Frutos, Lee, & Kury, 2004) . Other studies have found no relation between acculturation and postpartum depression (Beck, Froman, & Bernal, 2005; Martinez-Schallmoser, Telleen, & MacMullen, 2003). These inconsistent results may be attributed to the measurement of acculturation across these studies (Beck, 2006).

Given the conflicting results and measurement issues concerning acculturation, a sound measurement of a pregnant woman's level of acculturation may be central to understand how adhering to traditional cultural values affects the development of postpartum depression. Recent research on acculturation has suggested multidimensional and transactional models of acculturation (Berry, 2003). These models may be important to consider when studying birth outcomes and maternal mental and physical health in the

postpartum period (Beck, 2006). It has been hypothesized that as Mexican American women become more acculturated, they become less integrated with their culture of origin, leading to less exposure to and benefit from "culture-specific protective factors," (e.g. physical proximity and emotional reliance on family; see Page [2004] for a review). The proposed model may fill some of the gaps in the current literature by using a multidimensional, multi-measure assessment of adherence to cultural values and examining the resulting effect on depressive symptoms in the postpartum period.

Other culturally relevant protective factors for Mexican American mothers may include familism and engaging in traditional postpartum practices. Familism, or the belief that the family is a core focus of one's identity and foundation for support, is an important safeguard against the development of postpartum depression in Mexican American women (Sagrestano, Feldman, Killingsworth Rini, Woo, & Dunkel-Schetter, 1999). Adhering to familism beliefs may have several components such as relying on family for emotional or physical support (Knight et al., 2010), suggesting a need to assess familism as a multidimensional construct. In one study, familism was a protective factor against the development of postpartum depression in a sample of low-income Mexican American mothers, whereas other culturally specific constructs (e.g. traditional gender roles and immigration status) were not statistically significant protective factors (Luecken, Gress-Smith, Howe, & Lemery-Chalfant, 2010). This cultural ideal regarding the family as an important source of support and key aspect to identity is essential to explore in the context of resilience in Mexican American mothers.

Lastly, there is a belief within Mexican culture termed *La Cuarentena*, a 40 day period following birth that precludes new mothers from engaging in certain activities

(e.g. daily chores, eating certain foods, and other behavioral suggestions). Women who immigrate to the US are more likely to observe La Cuarentena than Mexican Americans born in the United States (Gaviria, Stern, & Schensul, 1982; Wile & Arechiga, 1999) and may be less likely to experience postpartum depression (Stern & Kruckman, 1983). La Cuarentena includes ideas such as staying away from spicy food, relying on family to help with infant care taking, and not performing household chores. Following the principles of La Cuarentena may elicit, or be correlated with, extra support required to alleviate a new mother from these responsibilities. Incorporating the adherence to postpartum beliefs and practices, such as La Cuarentena, may provide insight into a specific cultural protective mechanism that plays a role in the development or recovery from postpartum depression. Culturally specific processes that contribute to resilience in Mexican American mothers such as acculturation, familism, and La Cuarentena have all been theoretically linked as protective factors against the development of postpartum depression in Mexican American mothers, but need to be investigated in a more systematic and comprehensive model.

Concurrent Stress, Depression, and Prenatal Resilience Resources

Previous research has indicated that experiencing stress or depressive symptoms during pregnancy can be a significant risk factor for postpartum depressive symptoms and other harmful child outcomes (Dunkel Schetter & Tanner, 2012). Thus, investigating how prenatal stress and depressive symptoms relate to resilience resources may be interesting to explore. A recent meta-analysis examined how various sources of prenatal stress confer risk for postpartum depression, and found "life stress" (as measured by perception of daily hassles, life events, etc.), socioeconomic status, or economic strain are

all individual predictors of perinatal depression (Lancaster, Gold, Flynn, Yoo, Marcus, & Davis, 2010); however, fewer studies have combined these stressors to form a comprehensive assessment of prenatal stress. Another review found that only 15 out of 115 questionnaires that assess during stress during pregnancy include stress that stems directly from pregnancy or parenting (e.g. uncomfortable physical symptoms, concerns about labor, delivery, and the baby; Nast, Bolten, Meinlschmidt, & Hellhammer, 2013). However, there have been direct connections between pregnancy-related symptoms or emotions and postpartum depression (Kamysheva, Skouteris, Wertheim, Paxton, & Milgrom, 2010; Di Pietro, Ghera, Costigan, & Hawkins, 2004), suggesting it is important to consider when conceptualizing stress in pregnant women. Given the low-SES status of Mexican American mothers in this sample, the importance of examining stress from the individual's perception, and potential influence of physical symptoms during pregnancy as a stressor, multiple facets of stress should be considered in relation to resilience.

Distal Outcomes of Prenatal Resilience

As mentioned previously, the proposed resilient profiles will be used to examine two different constructs. First, the model will be used to predict biological correlates of the resilient profiles. Second, how these prenatal resilience resources relate to postpartum depressive symptoms will be examined in the early postpartum period (six weeks postpartum; see Figure 1).

Biological correlates of resilience. The 'next wave' of resilience research has called for the integration of biological correlates or processes to "truly complete understanding of this phenomenon" (Curtis & Cicchetti, 2003). There has been significant development in understanding the contributions of various biological

mechanisms in conjunction with resilience (Charney, 2004; Southwick, Vythilingam, & Charney, 2005). This research has noted that it is important to investigate biological processes that are connected with physiological responses to environmental stressors (Curtis & Cichetti, 2003). Taking these research advancements and previous findings into consideration, three biological correlates measured during the postpartum period will be predicted by the prenatal resilient profiles– sleep, cortisol, and heart rate variability. Maternal sleep is constantly in flux during the pregnancy and postpartum periods, and has been linked to postpartum depression (Marques et al., 2010). Both decreased amounts of sleep and increased sleep fragmentation have been associated with increased depressive symptoms at four and eight weeks postpartum (Dennis & Ross, 2005). Thus, high quality or less disturbed sleep (outside of natural infant awakenings) during the postpartum period maybe associated with prenatal resilience and postpartum well-being.

Dysregulation of cortisol has been posited as a risk factor for postpartum depression in the early postpartum period (Entringer et al., 2010; Yim, Glynn, Dunkel-Schetter, Hobel, Chicz-DeMet, & Sandman, 2009). Increased risk of postpartum depression may be due to an interaction between the typical neuroendocrine changes that occur during pregnancy and dysregulation caused by prenatal stress. It is also possible that stressors experienced prior to pregnancy may heighten vulnerability for neuroendocrine dysregulation during pregnancy, which then has a lasting effect into the postpartum period. Current theories suggest that the HPA axis is significantly altered during pregnancy and undergoes a period of adjustment following childbirth that can last weeks to months (Glynn, Davis, & Sandman, 2013). This period of recalibration can lead to sustained levels of increased cortisol output as part of a “positive feedback loop”, and

result in hypercortisolism which has been suggested to be a risk factor for postpartum depression (Glynn, Davis, & Sandman, 2013). Other findings have corroborated this theory, finding that elevated prenatal cortisol is predictive of increased postpartum depressive symptoms (Nierop, Bratsikas, Zimmermann, & Ehlert, 2006; Yim et al., 2009). Examining the association between cortisol and depressive symptoms strictly in the postpartum period, one study concluded that HPA axis dysregulation (as indicated by decreased cortisol reactivity) was present in a group of depressed mothers at six and twelve weeks postpartum, compared to non-depressed mothers (Jolley, Elmore, Barnard, & Carr, 2007). In the current study, total cortisol output at six weeks postpartum (measured during an interaction task with their infant) was assessed and predicted by the prenatal resilient profiles. Prenatal cortisol was not available for this study; however, previous literature would propose that the neuroendocrine changes experienced during pregnancy would contribute to dysregulated hypercortisolism in the postpartum period and potentially postpartum depressive symptoms. Given results from the previous studies discussed above, it was hypothesized that women with higher use of prenatal resilience resources will have lower overall levels of cortisol at six weeks postpartum.

Another important potential biological correlate of resilience is heart rate. Heart rate variability (HRV) is the variability of time interval between heart beats as controlled by the sympathetic (SNS) and parasympathetic nervous systems (PNS). Low HRV has been coupled with depression (Gorman & Sloan, 2000; Yeragani et al., 1991) and high HRV with higher self-regulatory capabilities (e.g. affective and cognitive) in the face of environmental challenges (Appelhans & Luecken, 2006). It is hypothesized that higher levels of overall resilience processes measured during pregnancy will be associated with

higher HRV during the postpartum period. Taken together, these three domains of physiological functioning constitute a wide range of possible biological correlates to examine in relation to the broader model of resilience processes.

Postpartum depressive symptoms. A final aim of the current study is to examine resilience profiles, comprising of three factors of resilience processes (social, psychological, and cultural adherence), in relation to the occurrence of depressive symptoms in the postpartum period. The early postpartum period, measured here as the first six weeks, has been examined as a critical period in which postpartum depression often develops (Chaudron, Klein, Remington, Palta, Allen, & Essex, 2001). Further, the occurrence of postpartum depression or depressive symptoms during this sensitive period can be predictive of future depressive episodes (Goodman & Tully, 2006). The use of protective mechanisms during the prenatal period may help assuage the degree of depressive symptoms experienced during this period. This would be aligned with current resilience theory stating that resilience is not only associated with the *absence* of pathology, but the successful adaptation to life events (Masten, 2007). Further, examining how resilience resources function as a buffering mechanism between stress and postpartum functioning is also important to consider. For example, studies in other populations have examined resilience as a moderator between stressful environments and the manifestation of mental health concerns, such as posttraumatic stress disorder (Finchman, Korthals Altes, Stein, & Seedat, 2009). In the context of this study, examining the moderating, or buffering role, of various resilience profiles against the development of postpartum depressive symptoms in the context of economic stress would

provide insight in to positive adaptation following childbirth in low-income Mexican American mothers.

The current study. Despite the growing literature on the consequences of postpartum depression for both mother and infant, there is very limited research on the greater proportion of women who do not develop postpartum depression but are exposed to similar environmental stressors (e.g. poverty and limited access to health care). Identification of factors associated with this resilient response could yield important information regarding postpartum depression and population sensitive interventions. The current study was designed to investigate several domains of prenatal resilience resources (i.e. psychological, social, and cultural) together as resilient profiles. The execution of this study in a sample of low-income Mexican American mothers at high risk for developing postpartum depression has important public health significance for maternal and infant psychological and physical health.

There were several hypotheses associated with the current study. First, it was anticipated that the observed measures will form multiple latent resilient profiles. The final number of profiles that can be extracted may be limited by the sample size, but it was hypothesized that at least two profiles of resilience would emerge. For example, one latent profile may indicate high family support, high familism, low acculturation, and low personal mastery. This profile would be aligned with the protective nature of adhering to cultural values and not adopting elements of the majority culture. Such phenomena are commonly described within the 'Hispanic" or "Latina" paradoxes, as described above (e.g. McGlade, Saha, & Dahlstrom, 2004). Another profile may indicate high levels of mastery, problem solving coping, and general social support, but low belief in La

Cuarentena and Mexican orientation. This profile would suggest the beneficial nature of adopting mainstream values, perhaps to compensate for the absence of other resources, such as family members who are not within close physical proximity. As described above, theories regarding the adaptive benefits of biculturalism would suggest that a profile that included aspects of both Mexican and Anglo cultures could also be identified. Each profile would provide insight into the multiple profiles of resilience, rather than assuming there is one model that fosters resilience in the context of pregnancy and childbirth. Examining psychological, social, and cultural variables without a specified factor structure allowed for each construct to operate independently and not assume that these factors were universally beneficial for all women in this population. It should also be noted that taking a person-centered approach to resilience via latent profile analysis does not preclude the possibility that a profile of risk or low-resources may also emerge. Determining risk versus resilient profiles was confirmed by examining profiles membership and concurrent outcomes such as prenatal stress and depressive symptoms, as a measure of validity. It was hypothesized that profiles indicative of resilient processes would be associated with lower prenatal stress and depression, compared to low-resource profiles. It was also expected that risk and resilient profiles would not be opposite of one another, further supporting resilience as a unique process that warrants individual consideration and evaluation.

Second, biological correlates (i.e. sleep, cortisol, and heart rate variability) during the postpartum period were examined. Biological correlates were predicted by the membership in the prenatal resilient profiles, thus providing some preliminary insight into possible mechanisms of biological resilience. As stated above, it was hypothesized

that resilient profiles predicted lower levels of self-rated insomnia, lower overall cortisol output, and higher baseline HRV. Third, it was expected that women using resources of various resilient profiles would have overall lower levels of depressive symptoms at six weeks postpartum. This hypothesis was also extended to examine the moderating effect of resilience profiles on the relation between prenatal economic stress and postpartum depression. It was predicted that in the context of economic stress, women classified into resilient profiles would have significantly less depressive symptoms than those in non-resilient profiles, thus supporting the use and effectiveness of resilient resources in low SES Mexican American mothers.

METHODS

Participants

Participants for the study included 324 pregnant, low-income Mexican American women from the ongoing longitudinal study, *Coregulatory Processes and Postpartum Depression in Mexican- Americans*. This sample represents an underserved and under researched population of women who are at a high risk for postpartum depression and other health disparities. Women were recruited from a prenatal clinic in Phoenix, Arizona that serves low-income populations. Pregnant women (up to 38 weeks gestation) were approached in these clinics by a bilingual interviewer and asked if they met eligibility requirements which included: (1) self-identification as Mexican American, (2) fluent in Spanish or English, (3) between the ages of 18-45, (4) singlet pregnancy, and (5) anticipated healthy delivery. Low-income status was determined by self-report or eligibility for Medicaid. A bilingual interviewer collected contact information and scheduled the first prenatal home visit, during which informed consent was obtained.

Demographic information including participant age, marital status, number of biological children, number of people living in the home, education, and income are listed in Table 1.

Procedures

This study used data from the prenatal and six week postpartum home visit interviews. All interviews were conducted by bilingual interviewers, carried out in the participant's language of choice, and questions were read out loud to account for variations in literacy. Each interviews lasted 1.5 to 2 hours. Women were compensated $75 for the prenatal home visit and $50 for the six weeks postpartum home visit.

Measures

Psychological resilience

Personal mastery (PM). Personal mastery was assessed with the six item Pearlin Mastery Scale (Pearlin & Schooler, 1978), which has a four point Likert response set ranging from strongly agree to strongly disagree. Items asked women about the overall control they have over events in their life (e.g. "I often feel helpless in dealing with the problems of life"). Answers were summed to a total score, with higher scores indicating a greater level of personal mastery. In the current study the reliability was α= .67.

Coping. Coping was assessed using the Ways of Coping Questionnaire (WOC, Folkman & Lazarus, 1988). The WOC was designed to assess a range of thoughts and behaviors people utilize during stressful situations. Analysis of the WOC in a Spanish speaking sample yielded six subscales, including seeking social support (α= .79)

and planful problem solving (α= .74; Munet-Vilaroa, Gregorish, & Folkman, 2002), which were used in the current study.

Social resources

Paternal support (PS). Paternal support was measured with a single item that asks the mother's overall level of satisfaction with the support she is receiving from the baby's father. Mothers chose from a five point Likert scale ranging from 'not at all' to 'extremely'. This question was used with a sample of low-income Mexican American in a pilot study for the larger grant (Luecken, Purdom, & Howe, 2009).

Family support (FS). Family support was measured using the global support question from PRAMS (CDC, 2004). Participants were asked what family members would be helpful if a problem arose during their pregnancy, and women selected members from a list. A score was formed reflecting the number of family members endorsed as being supportive during pregnancy.

General social support (GSS). The level of emotional and instrumental support women received during pregnancy was measured using the 17-item MOS Social Support survey (Sherbourne & Stewart, 1991). Answers ranged from 'none of the time' to 'all of the time' (on a scale of 1-5 respectively); higher scores represent higher levels of support. Sections of the MOS have been used with Hispanic mothers and had good reliability in a pilot study (α=.88; Luecken, Purdom, & Howe, 2009) and in the current study α=.96.

Cultural adherence

Acculturation (ACC). The Acculturation Rating Scale for Mexican Americans II (ARSMA-II; Cuèllar, Arnold, & Maldonado, 1995) was used to measure

acculturation. The ARSMA-II is considered a multi-dimensional and cutting edge assessment of acculturation specific to Mexican Americans (Beck, 2006), and is currently the most widely used measure of acculturation. Previous research, as well as the current study (α=.78), has established good reliability and validity with this measure (Cuèllar, Arnold, & Maldonado, 1995).

Familism (FAM). Adherence to cultural values and beliefs was measured with the Mexican American Cultural Values Scale (MACVS; Knight et al., 2010). The MACVS was developed to address shortcomings in current assessments of acculturation, and measures both acculturation and enculturation in Mexican Americans. The measure consists of multiple subscales that measure various aspects of familism that were totaled and used as a single construct of overall familism the current study. The MACVS demonstrated good reliability in this sample of Hispanic mothers (α= .86).

La Cuarentena (LC). To measure belief in culturally specific postpartum practices, a new 20-item measure, La Cuarentena was created for the larger study. The belief and practice of the behaviors during La Cuarentena (e.g. should refrain from spicy foods or family should help with infant care) may be an indication of acculturation (Gaviria, Stern, & Schensul, 1982; Wile & Arechiga, 1999), and may also be a protective factor from postpartum depression (Stern & Kruckman, 1983). In the current sample, the reliability for this exploratory measure was α=.76.

Outcome measures

Depressive symptoms. Depressive symptoms were measured during the prenatal and six week postpartum home visits with the10-item Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987). The EPDS measures both

global and specific depressive symptoms unique to pregnancy and postpartum periods (Eberhard-Gran, Eskild, Tambs, Opjordsmoen, & Samuelsen, 2001; Murray & Cox, 1990). Moderate to good test-retest reliability and adequate internal consistency have been reported across several studies (Boyd, Le, & Somberg, 2005). Additionally, The EPDS has been tested and shown to be a valid measure in Spanish-speaking samples (Garcia-Esteve, Ascaso, Ojuel, & Navarro, 2003). The current study supports the EPDS as a reliable measure during pregnancy (α=.86), and at six weeks postpartum (α=.86) in low-income Mexican American mothers. The EPDS also has limited item overlap with the proposed resilience measures.

Prenatal stress. A composite of three facets of stress was created to include multiple types of stress that may be particularly salient to low-income Mexican American women. These included perceived stress, economic stress, and pregnancy-related stress. All three scales were standardized and summed to form a composite score.

Perceived stress. Perceived stress was measured with a shortened version of the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). This questionnaire assesses the amount of overall general distress someone is experiencing (e.g. "How often have you felt confident about your ability to handle your personal problems?"). The shortened, four item version of the PSS demonstrated adequate reliability in Spanish speaking samples (Zambrana, Scrimshaw, Collins, & Dunkel-Schetter, 1997). The PSS has also been suggested to be a highly accurate and reliable measure of stress in pregnant women (Lancaster et al., 2010) and had a reliability of (α=.65 in the current study).

Economic stress. Perceived financial difficulties were assessed with the Economic Hardship Scale (EHS; Barrera, Caples, & Tein, 2001). The EHS, developed for low-income families, measures psychological aspects of poverty, including overall financial strain, lack of money for necessities, need for economic adjustments or cutbacks, and inability to make ends meet. Participants were asked to reflect on their financial situation for a 3 month time frame and answered 20 questions using a Likert scale ranging from 1-5 (α=.72), with higher scores indicating higher levels of economic strain. Scores from the four subscales were standardized and combined to form a single score of economic hardship.

Pregnancy stress. Stress that results from the physical and emotional complexities of pregnancy was assessed with an abbreviated version of the Pregnancy Experiences Scale (PES; DiPietro, Ghera, Costigan, & Hawkins, 2004). Women were asked ten items related to the physical (e.g. heartburn, sleep) and emotional (e.g. concerns about baby or labor/delivery) stress inherent to pregnancy. Women endorsed how stressful each item was on a Likert scale from 0-3, with 0= 'Not at all' and 3= 'A great deal'. Scores were summed with higher scores indicative of more pregnancy related stress. The original scale demonstrated good reliability, convergent and discriminant validity (DiPietro, Ghera, Costigan, & Hawkins, 2004). The current study suggests the PES had good reliability in low-income Mexican American mothers (α=.75).

Biological correlates of resilience

Sleep. Postpartum sleep difficulties and levels of insomnia were assessed using the 7-item Insomnia Severity Index (ISI; Bastien, Vallieres, & Morin, 2001). The ISI is a reliable and valid measure of clinically significant levels insomnia (Bastien, Vallieres, &

Morin, 2001). It also assesses various aspects of sleep difficulty (e.g. trouble falling asleep, waking in the middle of the night, etc.). Scores above 15 indicate clinically significant levels of insomnia, however; the utility of this measure in a sample of low-income Mexican American mothers is currently unknown. The current study found good reliability in this sample (α=.76).

Salivary cortisol. Saliva samples were collected from mothers during the six week postpartum home visit. Procedures for collection followed current research guidelines (Nicolson, 2008). Cortisol was collected at baseline, immediately following an interaction task between mother and infant, 20 minutes post-task, and 40 minutes post-task. Salivette sampling devices were used for collection (Sarstedt, Rommelsdorf, Germany). Samples were frozen, shipped to Salimetrics (Baltimore, MD), and analyzed for free cortisol. Overall cortisol output was used for analysis and computed using total area under the curve (AUCg) outlined by Pruessner, Kirschbaum, Meinlschmid, & Hellhammer (2003). A trapezoidal formula, which captures the area under the curve of the repeated cortisol measurements, was used for analyses. Because these interaction tasks were completed during home visits, there was some variation in the timing of the mother-infant tasks. Thus, time between samples was taken into account in the AUCg calculation. AUCg was also log-transformed to meet standards of normality (e.g. skewness and kurtosis) for regression analyses.

Heart rate. Baseline heart rate variability (HRV) was measured at the six week in person home visit. Electrodes were placed in three locations on the mother's torso and recorded according to recent guidelines (Thayer, Hansen, & Johnsen 2008). Continuous ECG data was collected with Trillium 5000 holter recorders (Forrest Medical). Following

data collection, all files were examined in QRS Tool software, hand corrected for artifacts, and analyzed with CMETx software (Allen, Chambers, & Towers, 2007). Domain frequency analysis technique was used to measure interbeat intervals; the natural log of the variance of those interbeat intervals was used in the current analyses as an index of HRV.

Biological covariates. Several environmental influences (e.g. exercise, food, alcohol, or caffeine consumption) can influence the biological samples used in this study. Questions about these environmental factors were asked using a questionnaire with yes or no responses. If any of the variables were significantly related to the probability of profile membership and the physiological outcomes (e.g. cortisol or heart rate variability), they were included in the final models as potential covariates.

Data Analysis Plan

Preliminary analyses. Data were reduced to scale scores and variables were checked for distribution, normality (e.g. skewness and kurtosis), and overall descriptive information to ensure the integrity of the data. Correlations between the indicators were examined to assess the relations among the variables.

Primary analyses. Latent profile analysis (LPA) was executed in MPlus (Muthén & Muthén, 2012) to assess latent resilient profiles. The purpose of LPA is to identify latent clusters of individuals who share a common score profile, similar to a multiple group model. LPA is advantageous to other latent factor analyses because it allows for the investigation of categorical rather than continuous differences among potential groups of individuals. LPA also allows the data to be analyzed as a mixture of commonly shared profiles, rather than as a single model where scores must operate in

the same direction (e.g. if paternal support is high, family support must be elevated as well; Pastor, Barron, Miller, & Davis, 2007). In other words, LPA allows for qualitative differences, such that individuals can have elevated scores on some indicators, but not others.

Model fit for LPA involves a hybrid of statistical indices and examining each solution within the study's proposed theory. Current studies and guidelines recommend the Bayesian information criterion index (BIC; Schwarz, 1978), sample-size adjusted BIC, Lo-Mendel-Rubin test (LMR; Lo, Mendell, & Rubin, 2001), model stability as measured by log-likelihood replication, posterior probabilities, and proportion of profiles membership as statistical measures of fit in LPA (Pastor, Barron, Miller, & Davis, 2007; Geiser, 2012). The BIC is a form of log-likelihood that takes the number of model parameters and sample size into account, such that models that add additional parameters are penalized based on sample size, and more parsimonious models are less penalized. BIC values can also be used to compare non-nested models with lower values indicating better model fit. Sample-size adjusted BIC is not as penalizing as the BIC and may be a superior tool for comparing models (Enders & Tofighi, 2008). The LMR test compares the same parameters in a model with one less profile—a small *p*-value indicates the more complex solution (e.g. more profiles) is a better fit to the data. The LMR test also provides a marker of significance, which is not available with the BIC. Proportion of profile membership and posterior probabilities are also important pieces of information to take into account when evaluating model fit in LPA. Good-fitting models should not include profiles with small numbers of subjects (i.e. < 5% of the sample). Models with higher correlations for accurate latent profile assignment, also known as

posterior probabilities (the correlations between likelihood of profile membership and actual profile assignment), are also indicative of better model fit. As previously mentioned, these statistical markers combined with theory and profile distinctiveness should be used to judge the final number of profiles extracted (Pastor, Barron, Miller, & Davis, 2007). For the purposes of this study two, three, and four profile solutions were analyzed.

Once latent resilient profiles were identified, multiple regression analyses examined the extent to which resilient profile membership was associated with concurrent stress, prenatal depressive symptoms, biological correlates from the six week postpartum time point, and six week postpartum depressive symptoms. Prenatal depressive symptoms were used as a covariate to ensure the predicted depressive symptoms emerged during the postpartum period.

RESULTS

Descriptive Statistics and Correlations

Descriptives for the study variables are presented in Table 2. Several of the variables, including Familism, had high skewness and kurtosis. However, normality is not an assumption of LPA (Pastor, Barron, Miller, & Davis, 2007). Correlations among all of the variables included in the LPA are presented in Table 3. When examining these correlations, two important points emerge. First, all ten facets of resilience were significantly associated with at least two other variables (all *r* values ranged from -.37-.55; *p's* < .05). This lends support for the inclusion of all ten resilience variables in the latent profile analyses. As there was not a high degree of overlap among the constructs, the formation of composites was unnecessary and each subscale remained separate in the

analysis. Lastly, all of the variables were standardized in order to have all of the constructs on a comparable scale.

Latent Profile Analysis

Two profile solution. The two profile solution is depicted in Figure 2. The BIC and sample-size adjusted BIC are listed in Table 4 and were used for comparison to the other profile solutions. The posterior probabilities for profile assignment among the two profiles ranged from 0.92-0.94, indicating high agreement between probable and actual profile assignment. The classification of profile membership was *n*=148 (45.7%) and *n*=176 (54.3%) for profiles one and two, respectively. The LMR test was significant ($p < .05$), suggesting that a two profile model was significantly better than a singular profile of resilience. For the two profile solution, the first profile is higher in Anglo orientation and lower on all other constructs, except family support. Between the two distinct profiles, the largest differences occurred for paternal and general social support.

Three profile solution. The three profile solution (see Figure 3) had lower BIC and sample-size adjusted BIC values compared to the two profile solution (BIC Δ= 63.69; sample-size adjusted BIC Δ= 130.30see Table 4), substantiating a three-profile solution. The posterior probabilities were also higher (ranged from 0.92-0.95; see Table 5) in the three-profile solution compared to the two-profile solution, indicating a better classification of the sample within three profiles. The profiles were also well distributed. Profile one consisted of 30.3% of the sample (*n*= 98), profile two consisted of 29.6% of the sample (*n*=96), and profile three consisted of 40.1% of the sample (*n*=130). Additionally, the LMR was significant ($p < .05$), providing further support that the three profile solution is a better fit to the data than a two-profile solution.

The three-profile solution is characterized by differences across psychological, cultural, and social resilient resources. Profile two emerged as having higher levels of psychological resources, Anglo orientation, and all types of support, but lower endorsement of La Cuarentena, Mexican orientation, and familism compared to profile three. Profile one appears to have lower levels of most resilient constructs particularly paternal support. Profile one also has lower levels of reported Anglo orientation compared to profile two, but more than profile three. Profile three is namely characterized by the highest relative levels of Mexican orientation, La Cuarentena, and familism. In sum, the three profiles demonstrate distinct patterns and do not overlap over multiple variables.

Four profile solution. A four profile solution was also extracted from the data. However, the model required an increased number of random starts and specified starting values based on the three-profile solution to converge. Further, the four-profile solution had more difficulty replicating log-likelihood values, which is indicative of decreased model stability. Compared to the three-profile solution, four profiles had lower BIC and sample-size adjusted values (BIC Δ= 14.38; sample-size adjusted BIC Δ= 80.99; Table 4). The profile membership was relatively well divided; profile one consisted of 29.0% of the sample (*n*=94), profile two consisted of 26.5% of the sample (*n*=86), profile three consisted of 30.6% of the sample (*n*= 99), and profile four consisted of 13.9% (*n*=45) of the sample. The posterior probabilities in the four-profile approach ranged from 0.90-0.94, which is lower than the three-profile solution, suggesting that the sample is more accurately classified in three profiles (Table 5). The LMR test was not significant (*p* =.38), favoring the more parsimonious three-profile solution.

The profiles, as seen in Figure 4, also demonstrated a higher degree of overlap, compared to the two- or three-profile solutions. Similar to the three-profile solution, profile two was marked by high endorsement of Anglo orientation and multiple sources of social support. Profile three had the second highest level of Anglo orientation, but lowest levels of psychological resources (e.g. mastery and coping), endorsement of cultural constructs, and general social support. Profiles one and four had similar levels of Mexican orientation and parallel patterns across cultural facets of resilience, but differed on partner and general social support.

LPA Summary. Overall, the conceptual and statistical evidence strongly supports the three-profile solution. The three-profile solution had the most accurate classification of the sample, as exemplified by the highest posterior probability values. The three-profile solution also had a significant proportion of the sample in each profile, did not encounter issues converging on a final solution or replicating log likelihood values, and was supported by a significant LMR test. The four-profile had the lowest BIC and sample-size adjusted BIC value compared to the two- and three-profile solutions; however, the decreased model stability and non-significant LMR test suggest the four-profile model may not be the best fit to the data. When evaluating LPA solutions, any one of these statistical markers would not be sufficient; however, collectively, it presents a sound conclusion for the three-profile solution.

In addition to statistical benchmarks, one must also ensure the final solution is theoretically viable. The profiles that emerged in the three-profile solution are consistent with some of the *a priori* hypotheses of the current study. Specifically, it was conjectured that profiles would differ on Anglo versus Mexican orientation; profiles that

endorsed higher levels of Anglo orientation may also be comparatively higher on psychological resources such as personal mastery and problem solving coping. Given the statistical findings and theoretical relevancy, the three-profile solution was used for all subsequent analyses. The three profiles were further identified as low-resource (profile one), high-resource Anglo (profile two), and high-resource Mexican (profile three; see Figure 3).

In order to help elucidate the magnitude of the differences between the variables effect sizes were calculated comparing all possible profile combinations (e.g. profile one versus two, profile two versus three, etc.; see Table 6). Cohen's *d* was used as the measure of effect size and the established standards for a small, medium, and large (.2, .5, and .8, respectively) were used for interpretation (Cohen, 1988). Within the three-profile solution, the comparison of profiles one versus two had large effect size differences in personal mastery, Anglo orientation, paternal, and general social support. When compared to each other, profiles one and three did not differ on any psychological resources, but did have large effect sizes in Anglo and Mexican orientation, and paternal support. Lastly, when directly compared, profiles two and three had large effect sizes in the differences in Anglo orientation and Mexican orientation, and family support (all *d*'s $\geq .8$).

Validation and Distal Outcome Analyses

Following the LPA, both concurrent and six week postpartum outcomes were analyzed. The probability of being classified in profile one, two, or three was used as a predictor in regression analyses. Prenatally, it was investigated how the profiles related to stress and depressive symptoms as measures of concurrent validity. Distal outcomes

including six week postpartum depressive symptoms, self-reported insomnia, cortisol, and HRV were also examined (Table 7). Regression diagnostics were completed and outliers were examined using studentized residuals and DFFITS to determine their influence on the results (Cohen, Cohen, West, & Aiken, 2003). No major issues with outliers emerged and all data points were included in the analyses. Regressions were analyzed with the probability of profile membership as separate independent variables and each of the outcomes listed below as the dependent variable. Additional tests were conducted to probe for significant differences between the resilience profile means. These analyses were conducted in MPlus to account for missing data (using maximum likelihood estimation) at the six week time point and provide results identical to an ANOVA.

Profile validation analyses

Prenatal depressive symptoms. Regression analyses included the probability of each profile as significant correlates of prenatal depressive symptoms. The results indicated that the probability of profile membership was significantly associated with prenatal depressive symptoms across all three profiles. Two cases were identified as outliers, removed from the data, and the regressions were re-analyzed; however, the estimates and significance did not change. Therefore all cases were included.

Regression analyses. Regarding profile one, the overall model was significant, $\chi 2$ (5, 324) = 2859.90, p <.001, adjusted R^2 = .10[1], and probability of membership in profile one was significantly correlated with higher depressive symptoms

[1] MPlus does not yield omnibus F tests for regression analyses. A chi-square statistic is used to test for overall significance.

ß = .32, (*SE* = .05), $p < .001$. The overall model for profile two was also significant, $\chi 2$ (5, 324) = 2888.72, $p < .001$, adjusted $R^2 = .02$. The probability of being in profile two was significantly associated with lower prenatal depressive symptoms, ß = -.14, (*SE* = .06), $p = .01$. Similarly, the overall model for profile three was significant, $\chi 2$ (5, 324) = 2885.03, $p < .001$, adjusted $R^2 = .03$, as was the probability for being assigned to profile three ß = -.17, (*SE* = .05), $p = .001$ (Table 8 for regression analyses summary). Regardless of profile membership, there was a significant concurrent association with prenatal depressive symptoms. Profile one had significantly higher levels of prenatal depressive symptoms and profiles two and three had significantly lower levels.

Profile differences. In order to test for significant group differences, follow-up analyses were conducted by analyzing pairwise comparisons of the profile means (see Table 9). These analyses revealed that there were significant mean differences of prenatal depressive symptoms between profiles one and two ($d = 9.6$, $p < .001$)[2], and between profiles one and three ($d = 9.7$, $p < .001$), but not between profiles two and three ($p = .94$; Figure 5). The effect sizes for the significant mean differences were large (Table 6).

Prenatal stress. To clarify the nature of resilience or risk in the identified profiles, analyses examined how the profiles related to concurrent levels of self-reported stress. A composite of prenatal pregnancy, perceived, and economic stress was created to represent a comprehensive assessment of stressors. As with the prenatal depressive symptoms, probability of being assigned to a profile was included as a predictor in a regression analysis with prenatal stress as the outcome. Two cases were identified as

[2] Mplus and ANOVA in SPSS yield identical results for profile difference analyses.

outliers, but did not significantly change any results and were thus retained in the analyses.

Regression analyses. Regarding profile one, the overall model was significant, $\chi 2$ (5, 324) = 2860.56, p <.001, adjusted R^2 = .08, as was the probability for being assigned to profile one, ß = .27, (*SE* = .05), p < .001. The model including profile two was also significant, $\chi 2$ (5, 324) = 2877.54, p <.001, adjusted R^2 =.03, as was the probability of being in profile two, ß = -.16, (*SE* = .05), p < .01. Similarly, the model for profile three was significant and $\chi 2$ (5, 324) = 2882.06, p <.001, adjusted R^2 = .01. The probability of being assigned to profile three was a significant predictor of prenatal stress (ß = -.11, (*SE* = .06), p = .05; Table 8). As with prenatal depressive symptoms, profile membership was significantly correlated with all three profiles. Profile one had significantly greater levels of prenatal stress; profiles two and three were negatively associated with stress.

Profile differences. Within pairwise comparisons of the profile means, profile one was significantly different from profile two (d = 3.6, p < .001) and profile three (d = 3.0, p < .001), with large effect sizes (Tables 6 and 8). Profiles two and three were not significantly different from one another (p =.41; Figure 6).

Six week postpartum outcomes

Postpartum depressive symptoms. Regression analyses were completed with probability of profile membership predicting six week depressive symptoms, controlling for prenatal depressive symptoms. Regression diagnostics revealed three outliers that had problematic studentized residuals, but did not influence the overall estimates and were retained for the regressions analyses.

Regression analyses. The overall models for all three profiles were significant (profile one: $\chi 2$ (7, 324) = 2860.50, p <.001, adjusted R^2 = .21; profile two: $\chi 2$ (7, 324) = 2889.56, p <.001, adjusted R^2 = .21; and profile three: $\chi 2$ (7, 324) = 2885.06, p <.001, adjusted R^2 = .22, respectively). However, the probability of profile membership was not a significant predictor in any of these models: profile one: ß = -.04, (*SE* = .05), p = .51; profile two: ß = -.02, (*SE* = .05), p = .67; and profile three: ß = .05, (SE = .05), p = .32, respectively; Table 8).

Profile differences. Follow-up analyses were conducted by analyzing pairwise comparisons of the profile means (Table 9). These analyses revealed significant mean differences between profiles one and profile two (d = 3.3, p < .05, Table 10), but not between profile one and profile three (p = .13), nor between profile two and profile three (p = .49; see Figure 7). These findings suggest a possible relation between the profiles and subsequent depressive symptoms, but that association is no longer significant when accounting for prenatal depressive symptoms.

Moderation analyses. Additional analyses examining the latent resilience profile membership as a moderator of the relation between prenatal economic stress and 6 week postpartum depressive symptoms were analyzed. Two sets of dummy codes representing comparisons of resilience profile one, two, or three were generated and used as predictors in two separate regression analyses to account for all possible pairwise comparisons (e.g. in the first set of dummy codes, profile one was identified as reference group, while in the second set of dummy codes, profile two was identified as the reference group; Cohen, Cohen, West, & Aiken, 2003).

The moderating effect of resilience profiles on the relation between economic stress and six week postpartum depressive symptoms were assessed using two different regression equations that included the main effects of prenatal economic stress and the resilience profile groups as well as interaction between these predictors (e.g. prenatal economic stress x profile group, See Table 11). One of the four possible interaction terms tested in these two sets of regression equations was significant, suggesting that the effects of economic stress on six week postpartum depression is different between profiles two and three ($\chi 2$ (4, 324) = 468.18, p <.001, adjusted R^2 = .06), ß = .18, (*SE* = .09), p < .05); all other interaction terms were non-significant (all *p's* > .05). Probing of the simple slopes yielded that only the slope for the profile three was significant (ß = .18, (*SE* = .05), p = .001; see Figure 8).

These moderation analyses were run again controlling for prenatal depression and yielded the same results, such that the overall regression equations were significant ($\chi 2$ (5, 324) = 472.81, p <.001, adjusted R^2 = .27), and the interaction term suggesting a difference between profiles 2 and 3 (ß = .15, (*SE* = .08), p = .052). However, after controlling for prenatal depressive symptoms the simple slope for profile three was now marginally significant (p = .08). This decrease in significance could be attributed to sample size (G*Power; Faul, Erdfelder, Lang, & Buchner, 2007) and difficulty detecting the small effect that was present in this analysis (d= .2).

Sleep. The possible relations between prenatal resilience and various biological correlates were also explored. The first among these was self-reported sleep disturbances, with the hypothesis that lack of prenatal resources could have an effect on sleep dysregulation in the postpartum period. Three cases were identified as possible

outliers, but did not significantly influence the estimates and were included in the analyses.

Regression analyses. The overall regression models with probability of profile membership predicting six week sleep disturbances were significant for profile one ($\chi 2$ (5, 324) = 2859.91, p <.001, adjusted R^2 = .00), profile two ($\chi 2$ (5, 324) = 2860.06, p <.001, adjusted R^2 = .00), and profile three ($\chi 2$ (5, 324) = 2859.95, p <.001, adjusted R^2 = .00). However, the probability of profile membership was not a significant predictor in any of these models (profile one: ß = .02, (*SE* = .06), p = .70; profile two: ß = -.002, (*SE* = .06), p = .97; and profile three: ß = -.02, (*SE* = .06), p = .73, respectively; Table 8).

Profile differences. Further, there were no significant group mean differences among the profiles (all *p's* > .05, see Figure 9, Table 9). Despite the lack of significant results, the patterns of means were similar to other outcomes, such that profile one had higher scores of sleep disturbances relative to profiles two and three.

Cortisol. Total cortisol output was measured as area under the curve (AUCg; Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003). Potential covariates associated with cortisol output were assessed and are displayed in Table 12. The covariates included: number of caffeinated beverages consumed that day, breastfeeding status, maternal age, smoking, exercise, time of last meal, and use of hormonal contraceptives. None of these covariates were significantly related to total cortisol output (AUCg) and profile membership, and were thus excluded from subsequent analyses. However, time of day was included due to the diurnal nature of cortisol patterns. Three cases were identified as possible outliers based on studentized residuals

and DFFITS values but their exclusion did not significantly influence the estimates and all data were included for these analyses.

Regression analyses. The regression analyses revealed that the overall model for profile one was significant ($\chi 2$ (7, 242) = 2135.72, p <.001, adjusted R^2 = .24). The probability of being assigned to profile one was significantly associated with total cortisol output at six weeks postpartum (ß = -.13, (*SE* = .06), p < .05). Although the overall models for profiles one and two were significant (profile two: $\chi 2$ (7, 242) = 2140.55, p <.001, adjusted R^2 = .23); (profile three: $\chi 2$ (7, 242) = 2140.97, p <.001, adjusted R^2 = .22), the probability of being assigned to profile two (ß = .08, (*SE* = .06), p = .18) or profile three (ß = .04, (*SE* = .06), p = .44) were not significant predictors of cortisol at six weeks postpartum (see Table 8 for regression summary).

Profile differences. Pairwise comparisons of the profile means indicated significant small differences between profiles one and three (d = -0.3, p < .05) and profiles one and two (d = -0.3, p < .05), but not two and three (p = .80; see Figure 10, Table 9, and Table 10).

Heart rate variability. Analyses were conducted to see if probability of profile membership predicted HRV at six weeks postpartum, with the hypothesis that higher HRV would be associated with profiles indicative of resilience. As with the cortisol analyses, possible covariates were also investigated (see Table 12). Maternal age and breastfeeding status were added to the model due to the significant correlations with membership in profiles two and three and HRV. Circadian rhythms are also inherent to HRV patterns, thus time of day was also added to the model.

Regression analyses. Regression analyses revealed that only profile three significantly predicted HRV at six weeks postpartum, $\chi 2$ (11, 259) = 2307.22, p <.001, adjusted R^2 = .08; ß = -.15, (*SE* = .07), p <.05. The overall model for profile one was a good fit to the data, $\chi 2$ (11, 259) = 2357.45, p <.001, adjusted R^2 = .06, as was profile two, $\chi 2$ (11, 259) = 2300.26, p <.001, adjusted R^2 = .07. However, the probability of profile membership failed to be a significant predictor in both models (profile one: ß = .05, (*SE* = .06), p =.40; profile two: ß = .11, (*SE* = .07), p = .10; Table 8).

Profile differences. Pairwise comparisons of the profile means indicated a medium effect size difference between profile two and profile three (d = 0.7, p <.05, Tables 9 and 10). The mean difference between profiles one and three approached significance (p = .06), and the mean difference between profiles one and two was not significantly different (p = .58; see Figure 11).

DISCUSSION

The current study used latent profile analysis (LPA), a person-centered method of analysis, to explore a model of prenatal resilience integrating psychological, cultural, and social aspects of resilience in Mexican American women. In addition to investigating latent profiles of resilience, the current study examined the prenatal resilience profiles as predictors of postpartum depressive symptoms, insomnia, total cortisol output, and heart rate variability at six weeks postpartum. This approach is congruent with the concept of *equifinality*, acknowledging that there may be more than one way to be resilient (Luthar, 2003) in the prenatal period.

The current findings suggest that multiple profiles of prenatal resilience, and a pattern of risk, may exist within a sample of low-income Mexican American mothers. These profiles appear to have different relations to biological processes including cortisol and heart rate variability, and the development of postpartum depressive symptoms. Implications of these findings for mental health treatment and prevention are discussed.

Latent Profile Analyses

There are several advantages to using individual-level analysis (e.g LPA), as opposed to regression or factor analytic methods. First, LPA allows individuals to be grouped according to shared attributes (assessed through patterns of means of various measures), instead of grouping similar variables as seen in factor analysis. Second, LPA operates on the assumption that there is an underlying latent construct that determines an individual's profile membership, which may be more comprehensive than using cutoffs or means on measures (Herman, Ostrander, Walkup, & Silva, 2005). LPA can also be a useful method for data reduction purposes and can reduce several measures into single measure of latent profile membership rather than factors with metrical indicators as seen in exploratory factor analysis. Further, LPA can also be used for confirmatory purposes to help understand the difference between individuals on external factors or for diagnostic purposes (Geiser, 2012). For example, studies utilizing LPA have looked at differential profiles and various subtypes of psychiatric disorders (Herman, Ostrander, Walkup, & Silva, 2005).

The results from the LPA revealed three distinct profiles: low-resource (profile one; see Figure 3), high-resource Anglo (profile two), and high-resource Mexican

(profile three). As indicated by the names, those characterized in profile one did not strongly subscribe to Anglo or Mexican cultural values. Additionally, low-resource/profile one mothers endorsed lower levels of individual level resources (e.g. personal mastery and coping) and social support resilience resources compared to the high-resource Anglo and high-resource Mexican profiles. In particular, women in the low-resource profile endorsed lower levels of paternal support, relative to the other two profiles, which has been investigated as a salient individual predictor of poor postpartum functioning (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1995; Sheng, Le, & Perry, 2010). These findings are consistent with other studies that have identified similar cultural groupings and theories regarding cultural adaptation (Berry, 2003; Cuèllar, Arnold, & Maldonado, 1995). One possibility is the low-resource profile is indicative of marginalization, which has been defined as failed assimilation into another culture, and embodies cultural loss with the original culture (Berry, 2003). Alternatively, marginalization can also occur when there are limited opportunities or decreased interest in maintaining one's culture or engaging with others (Berry, 2003). A bicultural, rather than low-resource pattern was originally hypothesized as one associated with resilience. Within a LPA framework a risk profile (such as the low-resource one found in this study) can emerge even though the empirical question was based on resilience. A bicultural profile may have also been difficult to discern due to the measurement of acculturation in this study. Because LPA examines various clusters of means, there may not have been ARSMA-II response patterns indicative of bicultural identity, (i.e. one cannot be high on Mexican and Anglo orientation). Other measures that are typological assessments of bicultural identity, such as the Bicultural Involvement Questionnaire

(Szapocnik, Kurtines, & Fernandez, 1980), may provide more insight into biculturism in this population.

The mental health correlates associated with the low-resource profile were confirmed by examining concurrent levels of depressive symptoms and prenatal stress. Women classified in the low-resource profile endorsed significantly higher concurrent depressive symptoms and stress, compared to the high-resource Anglo or high-resource Mexican profiles. These findings are consistent with other studies of Hispanic samples that documented an association between cultural marginalization and increased depression, anxiety, and the "least healthy outcomes" compared to populations with more adaptive patterns of acculturation (Hiott, Grzywacz, Arcury, & Quandt, 2006; Romero, 2000). Marginalization has also been associated with increased depression during pregnancy in Hispanic women (Walker, Ruiz, Chinn, Marti, & Ricks, 2012). However, the risks stemming from a psycho-social-cultural profile in pregnant low-income Mexican women have been largely uninvestigated. Findings from the current study indicate that cultural marginalization, or lack of cultural identity, may be associated with poor support and few individual-level psychological resources.

Women classified in the high-resource Anglo profile had the highest levels of individual resilience resources and lower levels of cultural values, such as familism, relative to the high-resource Mexican and low-resource profiles. They were also more likely than the other two profiles to have higher social support resilience resources, particularly family support. However, family support resilience resources were operationalized as the number of family members women could rely on during pregnancy, and both Anglo orientation and the quantity of family resources may be

conflated with length of time in the U.S. The protective nature of psychological and social resources is congruent with other studies that have identified high paternal support (Sheng, Le, & Perry, 2010; Sagrestano, Feldman, Killingsworth Rini, Woo, & Dunkel Schetter,1999) , mastery (Heliman, Frutos, Lee, & Kury, 2004), and support/problem focused coping strategies as protective resources (Gaurdino & Dunkel Schetter, 2013); however, several studies have identified higher Anglo orientation as a risk factor for postpartum depression, postnatal anxiety, decreased health care utilization, and decreased infant birth weight (Campos, Dunkel Schetter, Walsh, & Schenker, 2007; Davalia, McFall, & Cheng, 2009; Luecken, Purdom, & Howe, 2009; Martinez-Schallmoser, Telleen, & MacMullen., 2003). In the current study, women with higher Anglo orientation (albeit within a low acculturated sample) also had of support and individual-level protective factors, compared to the high-resource Mexican or low-resource profiles. Women in this profile also reported significantly lower levels of depressive symptoms and stress prenatally, compared to those in the low-resource resource profile but not lower than the high-resource Mexican profile. Thus, it appears that elements of Anglo orientation may be protective for Mexican American women in this population. Studies that have found Anglo orientation as a risk factor may have done so in samples with higher mean levels of acculturation compared to the current sample. Alternatively, other studies assessed acculturation with mean responses on self-report measures rather than with a latent profile approach, which could account for a difference in findings. It is also important to emphasize that the current sample is predominately Mexican oriented with high endorsement of cultural values/familism (as indicated by the demographics in Table 1 and overall means on the ARSMA-II and

MACVS seen in Table 2). Thus, within this context of high Mexican orientation, the high-resource Anglo profile may be better conceptualized as women who have adopted some elements of the majority culture and are exhibiting more bicultural flex, which has been indicated as the 'optimal' or most adaptive acculturative outcome (Lagana, 2003; Berry, 2003), rather than being predominately Anglo in their cultural identities.

As hypothesized, mothers in the high-resource Mexican profile endorsed higher levels of cultural values and lower levels of individual-level resilience resources compared to the high-resource Anglo profile, although not as low as the low-resource profile. Women in this profile may depend more on cultural sources of support and paternal or general support, rather than internal psychological processes. Mexican orientation and strong cultural values have been speculated as potential buffering mechanisms against the development of postpartum depression (e.g. Davalia, McFall, & Cheng, 2009). Specifically, orientation to one's family has been identified as a protective factor against poor postpartum outcomes (Sagrestano, Feldman, Killingsworth Rini, Woo, & Dunkel-Schetter, 1999), but few studies have accounted for coping, support, and multiple facets of culture, or examined multiple response patterns among these variables. Women in this profile endorsed less family support than the other two profiles, but as noted above, this may be attributed to less time spent in the United States, as family support was measured as the number of family members present to help during pregnancy. Indeed, compared to the low-resource profile, those classified into the high-resource Mexican profile endorsed fewer concurrent depressive symptoms and less stress, suggesting that both the high-resource Anglo and high-resource Mexican profiles are associated with well-being during the prenatal period. Two resilience profiles associated

with prenatal well-being provide evidence for the possibility of multiple ways to "be resilient", thus advancing our understanding of resilience in low-income Mexican American mothers.

The extant literature on prenatal depression has described numerous poor outcomes for mothers who experience depression during pregnancy including future depressive episodes, elevated subjective pain levels, and increased reports of physical health complaints (O'Hara & McCabe, 2013; Perlen, Woolhouse, Gartland, & Brown, 2013). Additionally, experiencing prenatal depression may pose additional risk to infant cognitive, adverse birth outcomes, and physical development (Chung, Lau, Yip, Chiu, & Lee, 2001; Deave, Heron, Evans, & Emond, 2008), emphasizing the far reaching effects of prenatal depression. Although the risks and public health significance are clear, calls for models of resilience during the pregnancy period (Dunkel Schetter, 2011), have been largely unanswered. Research on resilience and prenatal mood disorders have hypothesized that integrating multiple levels of resilience (e.g. social, individual, culture) is critical for understanding resilient resources (Curtis & Cicchetti, 2003; Dunkel Schetter, 2011; Halbreich & Karkun, 2006). These lines of research have also emphasized the importance of connecting resilience and biological processes.

Studies analyzing multiple levels and facets of prenatal resilience may be particularly important in high-risk populations that experience higher rates of postpartum depression. Mexican American women have been identified as a particularly salient high-risk group as they represent a high proportion of the United States population (Ennis, Rios-Vargas, & Albert, 2011) and currently have the highest birth rate in the United States (Martin et al., 2012). Further, Mexican American women

experience significant health disparities (Ramirez & De la Cruz, 2002), and report increased levels of postpartum depressive symptoms compared to the majority culture (Beck, Froman, & Bernal, 2005; Davila, McFall, & Cheng, 2009; Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012; Heilemann, Lee, & Kury, 2002; Martinez-Schallmoser, Telleen, & MacMullen, 2003).

Profile Validity and Moderation

Another aim of the study was to investigate the resilience profiles as predictors of postpartum functioning. There were mean group differences such that the low-resource profile had significantly higher levels of postpartum depressive symptoms than the other two profiles. However, there was no relation of profile membership to six week postpartum depressive symptoms after controlling for prenatal depressive symptoms. The lack of a main effect between profiles and postpartum depressive symptoms after prenatal depressive symptoms are controlled for could be due to a lack of variability in depressive symptoms levels between the prenatal and postpartum periods. In other words, if the level of depressive symptoms did not change between the prenatal and six week postpartum time frame, the profiles would not predict six week symptoms after controlling for prenatal symptoms. Although six weeks is a common time frame for assessment of postpartum depression, it may be too soon to capture increases in depressive symptoms or the impact of psychosocial factors in the development of new postpartum depressive symptoms. Researchers have suggested that studying symptoms over the course of the first postpartum year may better capture postpartum depressive symptoms as the interactions among psychosocial factors, physiological factors, and depressive symptoms

develop beyond the first few weeks of the postpartum period (Chaudron et al., 2001; Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012).

A separate analysis indicated that profile membership has an important buffering effect on the relation between prenatal economic stress and postpartum depressive symptoms. Specifically, economic stress was not significantly associated with postpartum depressive symptoms in high-resource Anglo women, but for those classified in the high-resource Mexican profile, higher prenatal economic stress predicted higher postpartum depressive symptoms. Stress did not predict postpartum depression in the low-resource group; however, at high levels of economic strain, the high-resource Mexican and low-resource groups reported similar levels of postpartum depressive symptoms. These results suggest a protective effect of the high-resource Anglo profile (e.g. personal mastery, problem solving and support seeking coping, and high social/paternal support) against the effects of low economic resources on the development of postpartum depressive symptoms.

As noted above, several studies have indicated that an Anglo orientation and adoption of mainstream values are not effective for mitigating the risk of postpartum depression in Mexican American pregnant women (Campos, Dunkel Schetter, Walsh, & Schenker, 2007; Davila, McFall, & Cheng, 2009; Martinez-Schallmoser, Telleen, & MacMullen, 2003). The results from the current study suggest that women who have adopted some degree of Anglo values had lower postpartum depressive symptoms prenatally and at six weeks postpartum. In addition, women in the high-resource Anglo profile maintained lower levels of depressive symptoms despite economic stress, thus suggesting the use of resilience resources and a protective effect against the development

of postpartum depressive symptoms. This moderation analysis provides insight into resilience 'in action' that would be overlooked by examination of direct effects of acculturation on depressive symptoms.

Comparatively, women in the high-resource Mexican profile may be particularly vulnerable to economic stress during the transition to motherhood due to other risk factors associated with health disparities, including lower education, decreased rates of health insurance, and discrimination (Ramierz & De la Cruz, 2002). Women in the high-resource Mexican group may not have the resources to cope with economic hardship they experience during the early postpartum period. Prenatally, women in this profile had significantly lower levels of depressive symptoms compared to the low-resource group. However, within the context of high economic stress, women in the high-resource Mexican profile may be as vulnerable to postpartum depressive symptoms as those in the low-resource profile. Future studies should examine whether this group "bounces back" over time, thus demonstrating resilience, or whether they remain at increased risk of postpartum depressive symptoms in the context of economic stress. Overall, the current results emphasize the importance of taking stressful environments into consideration and may have important implications for resilience theory. Resilience following a key turning point, such as the transition to motherhood, may be better analyzed as a moderator, rather than as a predictor of poor adjustment. Resilience profiles as moderators of economic stress and postpartum depressive symptoms are aligned with theories that conceptualize resilience as the successful negotiation of adversity (as seen in the high-resource Anglo profile), as opposed to the absence of pathology.

Resilience Profiles and Biological Correlates

Profile classification was used to predict total cortisol output and resting heart rate variability at six weeks postpartum. Contrary to initial hypotheses, the low-resource profile, which was most indicative of risk or poor psychological functioning, significantly predicted *lower* overall cortisol output. Also divergent from the hypotheses, the high-resource Mexican profile significantly predicted *lower* HRV compared to the low-resource and high-resource Anglo profiles. Given that the low-resource profile was most associated with psychological risk, these finding initially appeared poorly aligned with the previous findings in this study and resilience theory. However, contextual factors and potential duration of stress (e.g. chronic vs. acute) may help elucidate these findings.

Regarding an additional consideration for the cortisol analyses, women classified into the low-resource profile reported significantly more subjective stress and depressive symptoms prenatally. This profile was also marked by decreased coping resources, poor general social support, and lower paternal support compared to the two other groups, leaving few protective or buffering factors for women to utilize and demonstrate resilient outcomes. Thus, women in this profile of risk may have experienced stress with greater intensity or for longer periods of time leading to a blunted, or overall decreased, cortisol response. This conceptualization is consistent with other studies that have found an association between blunted cortisol and increased depressive symptoms in a sample of low-income non-pregnant Mexican women (Burke, Fernald, Gertler, & Adler, 2005). In addition to depressed populations, blunted cortisol patterns have been found in other populations under chronic stress such as diabetic patients (Bruehl, Wolf, & Convit, 2009), adults with a history of childhood trauma (Carpenter, Shattuck, Tyrka, Geracioio,

& Price, 2011), or negative parental relationships (Luecken, Kraft, & Hagan, 2009). Few studies have examined the chronic stress associated with acculturation in pregnant women. One study found that greater acculturation levels (e.g. more Anglo oriented) are associated with blunted cortisol in pregnant women of Mexican descent (D'Anna-Hernandez et al., 2012). Even though this study did not specifically examine various acculturation patterns or postpartum cortisol levels, the findings provide some insight into connections between acculturation and HPA activity. The current study builds on the results from D'Anna-Hernandez et al. (2012) by finding an association between blunted cortisol and low-resource or marginalized acculturation patterns, which may have manifested prior to, or during, pregnancy. Therefore, these findings may be related, but warrant more investigation. Variation in the measurement of acculturation between the current study and the D'Anna-Hernandez et al. (2012) study may contribute to the differences in blunted cortisol being associated with a lack of strong acculturative affiliation versus Anglo acculturation.

The relation between prenatal and postpartum cortisol levels are largely unknown, but a few studies have suggested that higher cortisol levels during pregnancy pose a risk for postpartum depression (Nierop, Bratsikas, Zimmermann, & Ehlert, 2006; Yim et al., 2009). Additionally, one study found a relation between concurrent decreased cortisol reactivity patterns and postpartum depression (Jolley, Elmore, Barnard, & Carr, 2007). Research has noted the maternal HPA system undergoes significant alterations mediated by the placenta during pregnancy, which then undergoes readjustment for several weeks or months following childbirth (Glynn, Davis, & Sandman, 2013). This may result in dysregulated postpartum hypercortisolism and decreased reactivity that begins during

pregnancy and can extend several months into the postpartum period; however, the role of chronic stress (e.g. low SES or acculturative stress) and its impact on cortisol dysregulation during the peripartum period is less known.

Resilience profiles were also examined in conjunction with HRV. HRV has been conceptualized as a physiological marker of emotion regulatory capabilities, with increased HRV being more adaptive to respond to external stressors and variable emotional states (Appelhans & Luecken, 2006). In the current study, mothers in the high-resource Mexican profile had significantly decreased HRV compared to the low-resource or high-resource Anglo profiles. However, decreased HRV appears incongruent with the concurrent lower depressive symptoms and stress compared to the low-resource profile. It is possible that the decreased HRV among women in the high-resource Mexican profile is indicative of processes other than poor emotion regulation. Resting HRV is often conceptualized as a trait measure; however, one could speculate that women in the high-resource Mexican profile had lower HRV as a response to the home interview process, reflecting a more state-like measure. HRV also has a state-like component in regards to concentration, and studies have found that increased task complexity and cognitive load is correlated with lower HRV (Borger, van der Meere, Ronner, Alberts, Geuze, & Bogte, 1999). Studies have also indicated that as effort or motivation increases during a concentration task, HRV decreases (Mulder et al., 1992; Thackray, Bailey, & Touchstone, 1979). It is feasible that women in the high-resource Mexican profile were exerting more attention or focus at the time HRV was measured because they were more affected by the research process or strangers in their home environments. Alternatively, women in this subgroup could have been exerting more effort or motivation because they

felt a greater cultural pull toward social desirability in the context of a research study. Studies examining HRV in low-income Mexican American mothers are scarce. The interpretation of HRV may be limited by a lack of understanding of physiological parameters in this population, and thus culturally biased toward the majority culture. It is possible that higher HRV is not indicative, or a necessary component, of resilience in high-resource Mexican women. Other indices of PNS activity (e.g. vagal tone, and high frequency HRV) may help shed light on these findings. Further, measuring HRV during a stress task, rather than during a resting period, may be an important avenue to explore to help explicate the relation between cardiac functioning and resilience in Mexican American mothers.

Regarding sleep dysregulation, it was anticipated that resilience profiles would buffer the occurrence of sleep dysregulation at six weeks postpartum; however, profile membership did not significantly predict self-reported insomnia, nor were there significant mean differences among the profiles. There was very little self-reported sleep disturbance, which is somewhat surprising given the sleep fragmentation that is typical of early postpartum care. This may suggest that mothers, regardless of profile membership, view the nighttime infant care as normative and not problematic.

Limitations

This study is not without limitations. First, more profiles of resilience may exist than appropriately fit the data in this study. The sample size likely hindered the ability to extract profiles that may reveal other patterns of risk or resilience. For example, even though the four-profile approach was not the best fit to the data, an additional profile suggested a highly Mexican oriented profile with higher levels of social support. Such

profiles may be present in studies with larger samples. As noted previously, the current sample was largely low acculturated and several of the measures had decreased variability which would also limit the number of profiles that could be extracted. Some of the measures in this study also posed a limitation. For example, family support was measured as the number of family members present during pregnancy. This could be conflated by family members who still reside in Mexico or other parts of the United States. A subjective measure regarding family support during pregnancy may have affected the results. In regards to demographic considerations, the profiles from this study would not be generalizable to other Latina or non-Hispanic pregnant samples, given the cultural constructs were specific to Mexican Americans. The relation of profiles to postpartum outcomes is also limited by a singular postpartum measurement at six weeks postpartum. Resilience profiles may also differ for first-time mothers compared to mothers with multiple children. This was not explored as it would have significantly limited the sample size; however, this may be an important question for future studies to consider.

Importantly, there are many domains of resilience that are not captured in the current study. For example, other studies have suggested the importance of personality factors, attachment style, and intelligence as factors of resilience (Werner, 1993). Incorporating more resilience based variables could also identify profiles of risk in addition to resilience, as evidenced by the low-resource profile in the current study. Further, culturally specific protective factors, such as religiosity (e.g. Magana & Clark, 1995), were also not included in the current analyses, but may enrich our understanding of cultural resilient resources. The outcome of postpartum depressive symptoms may also

be too narrow of a focus on postpartum functioning. Other outcomes such as postpartum anxiety, self-rated physical health, breastfeeding, or other health behaviors (e.g. health care utilization) could also vary in women classified in different profiles. The lack of prenatal biological measures was also a limitation of the current study as changes in cortisol, HRV, and sleep could not be assessed or used as dependent variables. Even though sleep and cortisol patterns are known to fluctuate during pregnancy, a prenatal time point could have allowed for these physiological processes to be included in the LPA and provided a model of bio-psycho-social-cultural resilience.

Future Directions

Resilience theory posits that individuals recover and bounce back over time (Masten, 2007). Future studies should re-assess resilience profiles at multiple time points over the course of the first postpartum year to more fully capture the relation between resilience, postpartum depressive symptoms, and physiological processes over time. This would allow studies to capture the function of resilience resources or recovery from depressive symptoms. Additionally, the protective effects of resilience profiles could be better understood if concurrent risk profiles were also examined.

Other theories have suggested the concept of "plasticity" in regards to biological aspects of resilience (Feder, Charney, & Collins, 2011). Plasticity refers to the ability for the body to recover, or return to homeostatic levels, following a stress task or natural stressor as an index of biological resilience, thereby minimizing allostatic load (McEwen, 1998). Studies may want to examine the plasticity of sleep, cortisol, or HRV rather than measurements of resting periods or singular time points. Specific to this population, future studies could greatly contribute to our understanding of acculturation as a form of

chronic stress in Mexican American women by connecting various patterns of acculturation and cortisol output to postpartum depression over multiple time points. Additionally, in regards to postpartum sleep, it is possible that sleep disruption is not stressful at six weeks postpartum, but could become problematic if the sleep disturbances extend further into the first postpartum year. Future studies should use multiple measurements of maternal and infant sleep, such as other self-report assessments of sleep that are specifically designed for the postpartum period and objective measurements (e.g. actigraphs). The results of the current study also suggest the importance of incorporating multiple physiological measures when examining resilience. The current findings suggest that physiological markers of resilience may vary in relation to acute (e.g. the home interview process) versus chronic (e.g. economic strain) stressors, underscoring the importance of capturing how resilience profiles function over time and across contexts.

Implications for interventions. The results of this study have important implications for interventions. The findings suggest that interventions should focus on women who do not endorse strong cultural affiliations (e.g. marginalized) during the prenatal period and do not have high levels of psychological or social resilience resources as a particular high-risk group. The results also highlight that there are multiple pathways to be resilient during the prenatal period. As such, various interventions that are specific to different resilience profiles may be an important avenue to explore. As noted above, it may be important to foster social support and individual level-resources for those with low-resource profiles, as resilient resources were not clearly identified and this profile was more indicative of risk for prenatal depressive symptoms. Such interventions may target personal mastery or various coping skills such as problem-solving. However, for

women who identify as high-resource Anglo but may be experiencing some prenatal distress, interventions should bolster resources that are already promoting resilience, such as further development of personal mastery and coping strategies. Likewise, in high-resource Mexican women, fostering tangible social support or building social networks would be more appropriate resilience resources to target. Interventions should be employed prenatally and focus on building resilience resources, ultimately aiming to ameliorate the development of postpartum depressive symptoms. Theoretically, this would be akin to Gallo & Matthew's (2003) concept of building 'reserve capacity'. Women could then use these resilience resources to navigate the challenges they face during the transition to motherhood. A recent meta-analysis concluded that psychosocial interventions are successful at reducing postpartum depression (Dennis & Brown, 2014). However, the interventions included in the meta-analysis did not contain culturally specific components nor were they targeted for minority populations despite the increased prevalence of postpartum depressive symptoms (see Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2011). Future studies should direct efforts at developing and validating interventions in high risk populations such as low-income Mexican American women.

Conclusion

This study suggests important connections among risk, resilience, and biological correlates in low-income Mexican American women undergoing the transition to motherhood. This study is the first to examine multiple aspects of resilience resources among Mexican American women using latent profile analysis. The three profiles revealed in this study (low-resource, high-resource Mexican, and high-resource Anglo)

provide insight into the differing nature of resources within a population of low-income Mexican American mothers. These resilience profiles appear to have differential associations with co-occurring depressive symptoms, as well as postpartum depressive symptoms, cortisol output, and resting HRV. Profile classification also moderated the effects of prenatal economic stress on postpartum depressive symptoms, such that women in the high-resource Anglo profile appeared to be buffered from the impact of prenatal economic stress on postpartum depressive symptoms, compared to women in the high-resource Mexican profile. Overall, the results provide support for resilience as a multi-faceted construct that may be characterized by multiple, distinct profiles within one population. This study also helps confirm a connection between resilience during the prenatal period and postpartum biological outcomes. Examining multiple profiles of resilience can aid in the development of prenatal interventions that strengthen resilience resources, and decrease subjective and physiological markers of stress and depressive symptoms. Ultimately, intervention efforts have the potential to help Mexican American women navigate the transition to motherhood successfully, and promote maternal well-being as well as overall family health.

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Table 1

Sample demographics (N= 324)

	N (%)	Range Observed	*Mean*	*SD*
Marital Status				
Married and Living w/Partner	56 (26.7)			
Married but not Living w/Partner	5 (2.4)			
Not Married but Living w/Partner	103 (49)			
Never Married and Not Living w/Partner	31 (14.8)			
Separated/Divorced	15 (7.1)			
Country of birth				
U.S.	30 (14.3)			
Mexico	180 (85.7)			
Education				
Did not attend school	2 (1)			
1 through 8 years of school	59 (28.1)			
Some high school completed	64 (30.5)			
High school graduate/GED	61 (29)			
Some college, vocational or technical school	8 (3.8)			
Associates/Vocational/Technical School	4 (1.9)			
College degree (BS/BA) or Above	12 (5.7)			
Number of children under 18 in the home		0-11	1.8	1.9
Number of biological children		0-9	2.06	1.8
Age		18-42	27.4	6.4
Age of immigration to the U.S.		0-34	16.3	7.6

Table 2

Descriptive statistics for latent profile variables

Scale	Mean	SD	Skewness	Kurtosis	Range
Personal mastery	22.56	3.63	-.18	-.34	13-30
Planful problem solving	6.82	3.75	.21	-.62	0-15
Social support coping	5.20	3.91	.33	-.91	0-15
General social support	50.90	15.75	-.87	.01	4-68
Paternal support	4.00	1.24	-1.31	.73	1-5
Family support	.98	.73	.03	-1.12	0-2
La Cuarentena	23.53	6.74	.03	-.37	6-40
Anglo orientation	2.56	.98	.49	-1.02	1.15-4.85
Mexican orientation	4.25	.60	-1.27	1.43	1.94-5.00
Familism	72.00	7.43	-2.22	10.33	21-80

Table 3

Correlations among LPA variables

Variables	1	2	3	4	5	6	7	8	9	10
1. Personal mastery	-									
2. Planful problem solving	.32**	-								
3. Social support coping	.22**	.55**	-							
4. General social support	.21**	.15**	.19*	-						
5. Paternal support	.06	.11	-.01	.31**	-					
6. Family support	.07	.06	.13*	.17**	-.05	-				
7. La Cuarentena	.03	.05	.13*	.14**	.07	.05	-			
8. Anglo orientation	.28**	.21*	.26**	.22**	.04	.24**	.01	-		
9. Mexican orientation	-.02	.06	.01	.04	.04	-.11	.11*	-.37**	-	
10. Familism	-.05	-.04	.07	.19**	.10	.03	.19*	-.09	.19*	-

$*p < .05$, $**p < .01$

Table 4

BIC and Lo-Mendell-Rubin (LMR) values for all profile solutions

	2	3	4
BIC	8915.44	8851.75	8837.43
Sample-size adjusted BIC	8642.66	8512.34	8431.37
LMR	294.16 p <.05	179.35 p <.05	143.24 p = .38

Table 5

*Posterior probabilities in two, three, and four LPA analyses**

Profile solution	2		3			4			
	1	2	1	2	3	1	2	3	4
1	**.94**	.06	**.95**	.04	.01	**.90**	.02	.07	.01
2	.08	**.92**	.06	**.92**	.02	.01	**.94**	.04	.01
3			.05	.02	**.93**	.04	.03	**.93**	.00
4						.07	.01	.00	**.92**

*Row = most likely latent profile membership; column = actual assigned latent profile

Table 6

Effect sizes (Cohen's d) of profile means for the three-profile solution

	Profiles 1 vs. 2	Profiles 1 vs. 3	Profiles 2 vs. 3
Personal mastery	- 1.0*	-.4	.6
Social support coping	-.5	-.1	.3
Problem solving coping	-.6	-.5	.1
Anglo orientation	-1.7*	.8*	3.5*
Mexican orientation	.2	-1.1*	-1.3*
Familism	-.2	-.6	-.6
La Cuarentena	-.2	-.5	-.2
Family support	-.4	.5	.9*
Paternal support	-1.8*	-1.5*	.3
General social support	-1.5*	-.7	.7

* Large effect size

Table 7

Descriptive statistics for validity and distal outcome variables

Scale	Mean	SD	Range
Prenatal depressive symptoms	6.11	5.52	0-25
Stress composite	0	2.18	-5.44-7.05
6 week depressive symptoms	4.56	4.97	0-21
6 week insomnia	8.41	4.54	1-25
Heart rate variability	7.65	.81	4.93-10.00
Cortisol AUCg	-1.06	.27	-1.75-.04

Table 8

*Summary of regression analyses**

Dependent variable	Independent variable[+]	β(SE)	*p*
Prenatal			
Depressive symptoms	P1	.32 (.05)	< **.001**
	P2	-.14(.06)	**.01**
	P3	-.17(.05)	**.001**
Prenatal Stress	P1	.27(.05)	< **.001**
	P2	-.16(.05)	<**.01**
	P3	-.12(.06)	**.05**
Postpartum			
Depressive symptoms	P1	-.04(.05)	.46
	Prenatal EPDS	.47(.05)	<**.001**
	Economic Stress	.05(.05)	.32
	P2	-.02(.05)	.67
	Prenatal EPDS	.44(.05)	<**.001**
	Economic Stress	.05(.06)	.40
	P3	.05 (.05)	.39
	Prenatal EPDS	.46(.05)	< **.001**
	Economic Stress	.04(.05)	.44
Sleep	P1	.02(.06)	.70
	P2	-.002(.06)	.97
	P3	-.02(.06)	.73
Cortisol	P1	-.13(.06)	<**.05**
	Time of day	-.46(.05)	<**.001**
	P2	.07(.06)	.18
	Time of day	-.47(.05)	<**.001**
	P3	.04 (.06)	.44
	Time of day	-.47 (.05)	< **.001**
Heart rate variability	P1	.05(.06)	.40
	Time of day	-.11(.06)	.06
	Breast feeding	-.14(.06)	**.02**
	Maternal age	-.14(.06)	**.02**
	P2	.11(.07)	.10
	Time of day	-.11(.06)	.08
	Breast feeding	-.13(.06)	**.04**
	Maternal age	-.10(.07)	.15
	P3	-.16(.07)	**.02**
	Time of day	-.11(.06)	.07
	Breast feeding	-.12(.06)	.06
	Maternal age	-.09(.07)	.16

* All overall models were a good fit to the data, as indicated by $\chi 2$, $p \leq .05$

[+] P = probability of profile membership

Table 9

Summary of profile means for outcomes

	Profile One	Profile Two	Profile Three
Prenatal concurrent outcomes			
Depressive symptoms	8.92	4.79	4.73
Stress	.95	-.60	-.35
Six week postpartum outcomes			
Depressive symptoms	5.47	3.80	4.33
Insomnia	8.57	8.38	8.27
Cortisol	-1.13	-1.02	-1.03
Heart rate variability	8.57	8.65	8.32

Table 10

Profile effect sizes (d) for concurrent and distal outcomes

	Profiles 1 vs. 2	Profiles 1 vs. 3	Profiles 2 vs. 3
Profile validation outcomes			
Depressive symptoms	9.7*	9.6*	*ns*[+]
Stress composite	3.6*	3.0*	*ns*
Six week postpartum outcomes			
Depressive symptoms	3.3*	*ns*	*ns*
Cortisol	-.3	-.2	*ns*
Heart rate variability	*ns*	*ns*	.7

* Large effect sizes
[+] Not significant

Table 11

Regression Analyses: Predicting six week postpartum depressive symptoms from prenatal economic stress by resilience profile

Dependent variable: Six week postpartum depressive symptoms				
	β	*SE β*	*p-value*	Model R^2
(Constant)	1.03	.10	<.01	.07*
Prenatal economic stress	.21	.10	.03	
Contrast 1[a]	-.11	.07	.10	
Contrast 2[b]	-.09	.07	.19	
Contrast 1 X Prenatal economic stress	-.11	.08	.16	
Contrast 2 X Prenatal economic stress	.05	.08	.58	
Dependent variable: Six week postpartum depressive symptoms				
(Constant)	.79	.13	<.01	.07*
Prenatal economic stress	-.01	.12	.96	
Contrast 2[b]	.03	.07	.62	
Contrast 3[c]	.11	.07	.10	
Contrast 2 X Prenatal economic stress	.18	.09	.04	
Contrast 3 X Prenatal economic stress	.12	.08	.14	
Dependent variable: Six week postpartum depressive symptoms				
(Constant)	.38	.13	<.01	.22**
Prenatal economic stress	.03	.09	.73	
Prenatal depressive symptoms	.45	.05	<.01	
Contrast 1[a]	-.02	.06	.81	
Contrast 2[b]	.04	.06	.55	
Contrast 1 X Prenatal economic stress	-.07	.07	.35	
Contrast 2 X Prenatal economic stress	.07	.08	.34	
Dependent variable: Six week postpartum depressive symptoms				
(Constant)	.37	.12	<.01	.27**
Prenatal economic stress	-.09	.10	.34	
Prenatal depressive symptoms	.44	.05	<.01	
Contrast 2[b]	.05	.06	.39	
Contrast 3[c]	.02	.06	.81	
Contrast 2 X Prenatal economic stress	.15	.08	.05	
Contrast 3 X Prenatal economic stress	.07	.07	.34	

Note. All continuous variables centered prior to analysis. β = Standardized regression coefficient. [a]Contrast 1=Profile One= 0; Profile Two=1; Profile Three=0. [b]Contrast 2= Profile One= 0; Profile Two=0; Profile Three=1. [c]Contrast 3= Profile One= 1; Profile Two=0; Profile Three=0 . *p <.05, **p<.01

Table 12

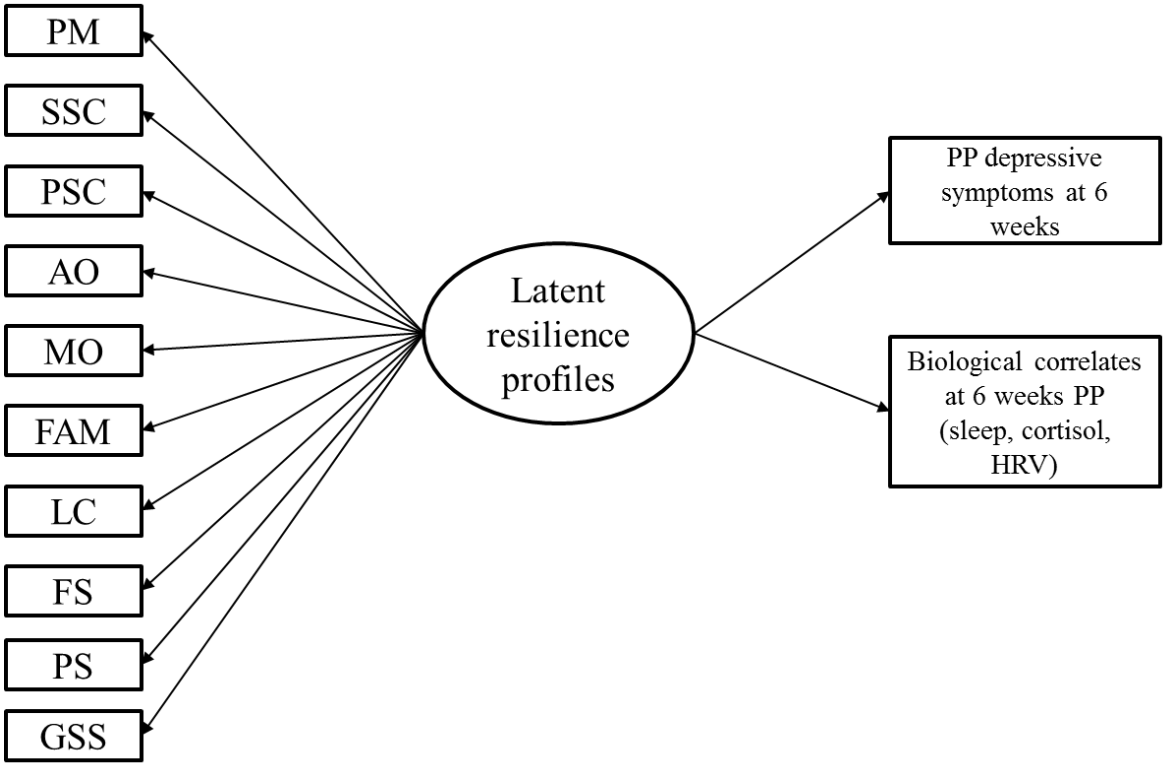
Correlations among cortisol (Log AUCg), heart rate variability (Log HRV), and possible covariates

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Profile one membership	--														
2. Profile two membership	-.44**	--													
3. Profile three membership	-.53**	-.54**	--												
4. Prenatal depressive symptoms	.32**	-.14*	-.17**	--											
5. Stress composite	.27**	-.16**	-.11	.63**	--										
6. 6 week depressive symptoms	.12*	-.09	-.03	.47**	.37**	--									
7. 6 week insomnia	.02	-.002	-.02	.35**	.31**	.53**	--								
8. Log HRV	.05	.18**	-.21**	-.03	-.04	-.04	-.03	--							
9. Log AUCg	-.17**	.09	.07	.07	.02	.05	.13	-.04	--						
10. Maternal age	.03	-.44**	.39**	-.001	.01	.13*	.03	-.16	-.01	--					
11. No. of caffeinated beverages	.08	-.01	-.06	-.03	-.05	-.05	-.12	-.02	-.17**	.07	--				
12. Smoking[+]	-.10	.12	-.02	.13	-.07	.18	.25	.15	-.33	.04	-.17	--			
13. Physical exercise[+]	.04	-.08	.04	-.07	-.02	.01	.06	.08	.18**	.04	.03	.10	--		
14. Hours since last meal	.10	-.09	-.01	-.01	.05	.01	.08	.15*	.18**	.03	-.18**	-.11	.05	--	
15. Breastfeeding status[+]	.01	-.21**	.19**	-.02	.03	.06	-.01	-.17**	-.06	.14*	-.04	-.05	-.001	-.09	--
16. Use of hormone birth control[+]	-.01	-.22*	.21*	.19*	.15	.01	.07	-.12	-.05	.15	-.02	-.21	.05	.01	-.07

*$p < .05$, **$p < .01$, [+] 1= yes, 0=no

Figure 1

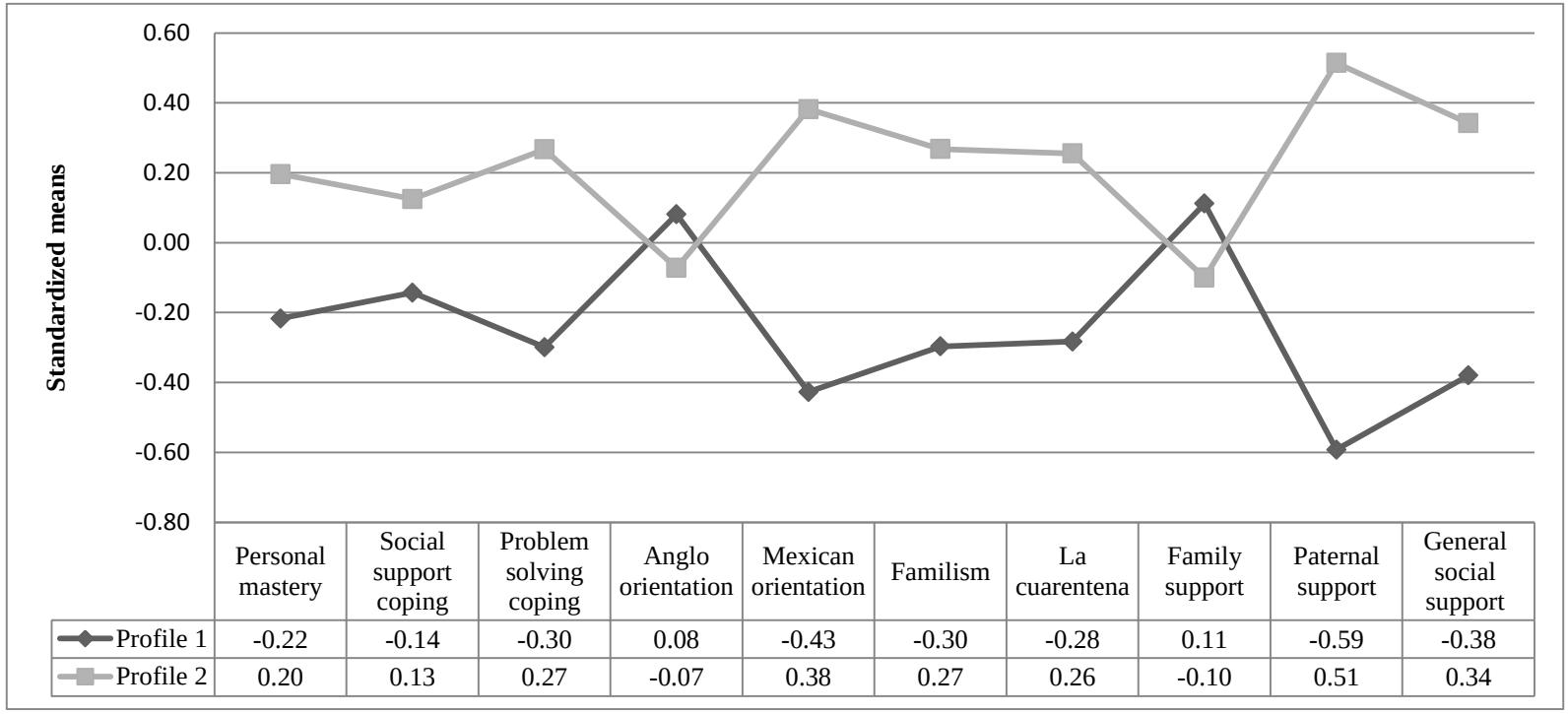
*Proposed conceptual model**



* Note: PM= Personal Mastery; SSC= Social support coping; PSC =Problem solving coping; AO=Anglo Orientation; MO= Mexican Orientation; FAM= Familism; LC= La Cuarentena; FS= Family Support; PS= Paternal Support; GSS= Global Social Support; PP= postpartum; HRV = heart rate variability

Figure 2

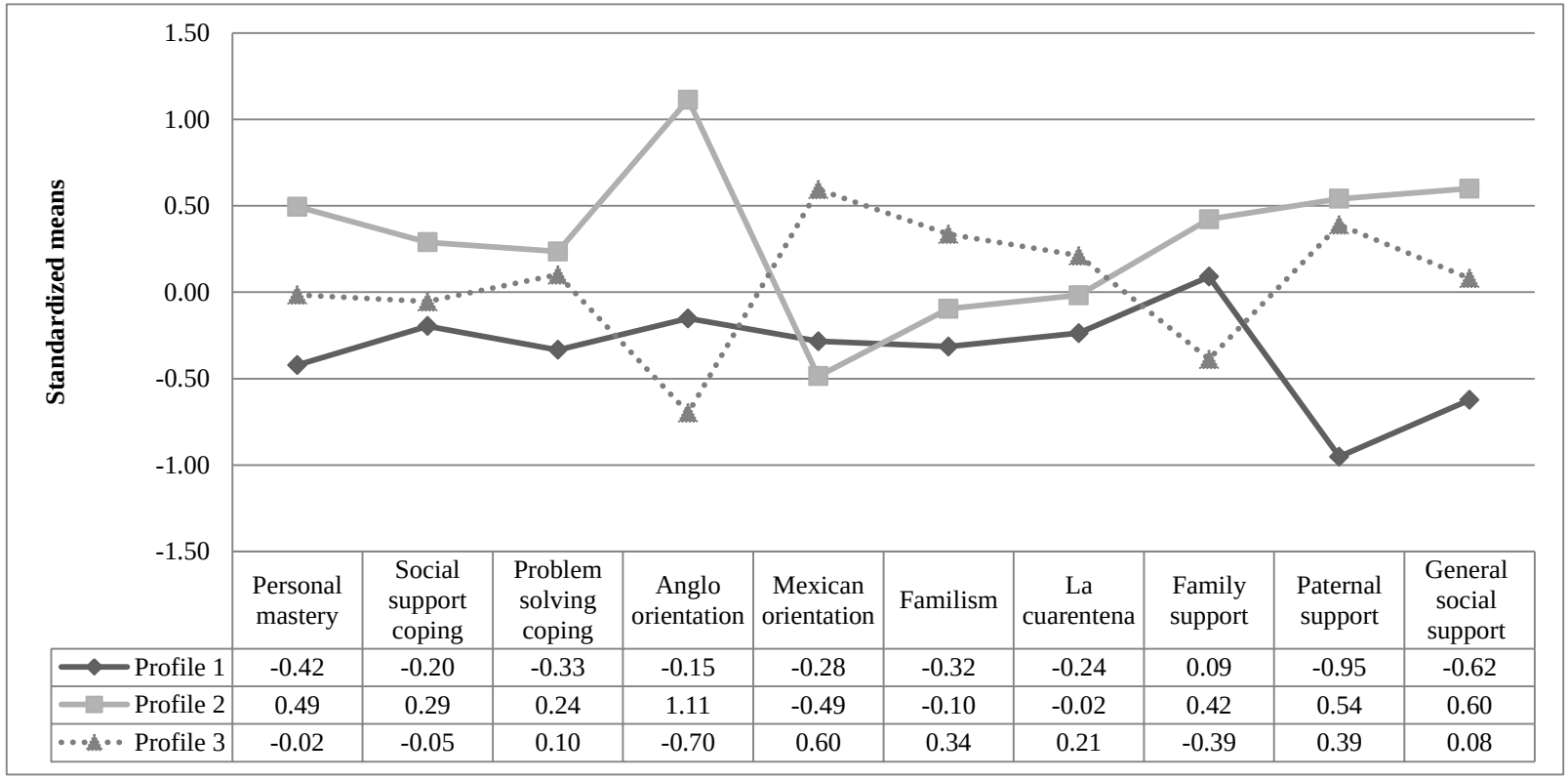
Two profile solution



	Personal mastery	Social support coping	Problem solving coping	Anglo orientation	Mexican orientation	Familism	La cuarentena	Family support	Paternal support	General social support
Profile 1	-0.22	-0.14	-0.30	0.08	-0.43	-0.30	-0.28	0.11	-0.59	-0.38
Profile 2	0.20	0.13	0.27	-0.07	0.38	0.27	0.26	-0.10	0.51	0.34

Figure 3

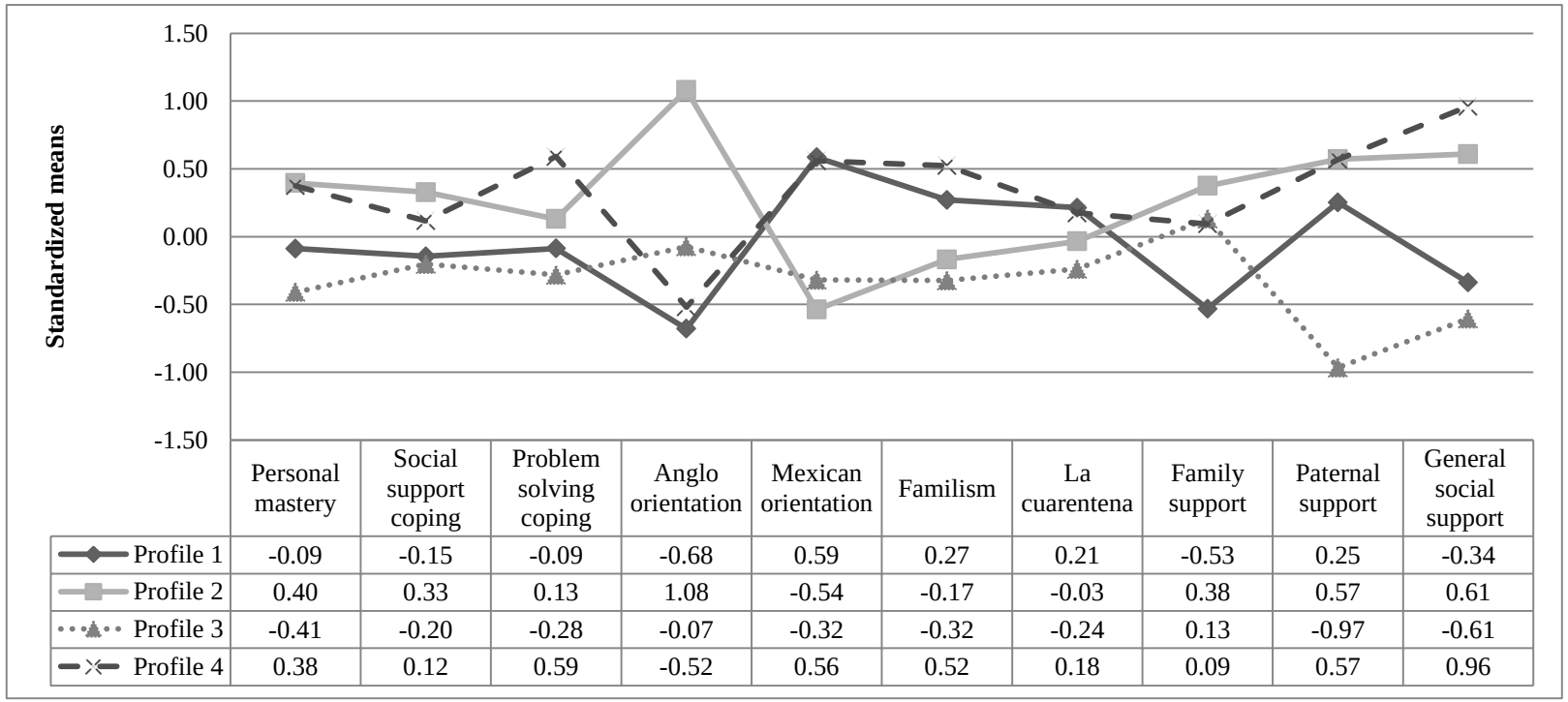
Three profile solution



	Personal mastery	Social support coping	Problem solving coping	Anglo orientation	Mexican orientation	Familism	La cuarentena	Family support	Paternal support	General social support
Profile 1	-0.42	-0.20	-0.33	-0.15	-0.28	-0.32	-0.24	0.09	-0.95	-0.62
Profile 2	0.49	0.29	0.24	1.11	-0.49	-0.10	-0.02	0.42	0.54	0.60
Profile 3	-0.02	-0.05	0.10	-0.70	0.60	0.34	0.21	-0.39	0.39	0.08

Figure 4

Four profile solution



	Personal mastery	Social support coping	Problem solving coping	Anglo orientation	Mexican orientation	Familism	La cuarentena	Family support	Paternal support	General social support
Profile 1	-0.09	-0.15	-0.09	-0.68	0.59	0.27	0.21	-0.53	0.25	-0.34
Profile 2	0.40	0.33	0.13	1.08	-0.54	-0.17	-0.03	0.38	0.57	0.61
Profile 3	-0.41	-0.20	-0.28	-0.07	-0.32	-0.32	-0.24	0.13	-0.97	-0.61
Profile 4	0.38	0.12	0.59	-0.52	0.56	0.52	0.18	0.09	0.57	0.96

Figure 5

Profile mean differences for prenatal depressive symptoms (EPDS)

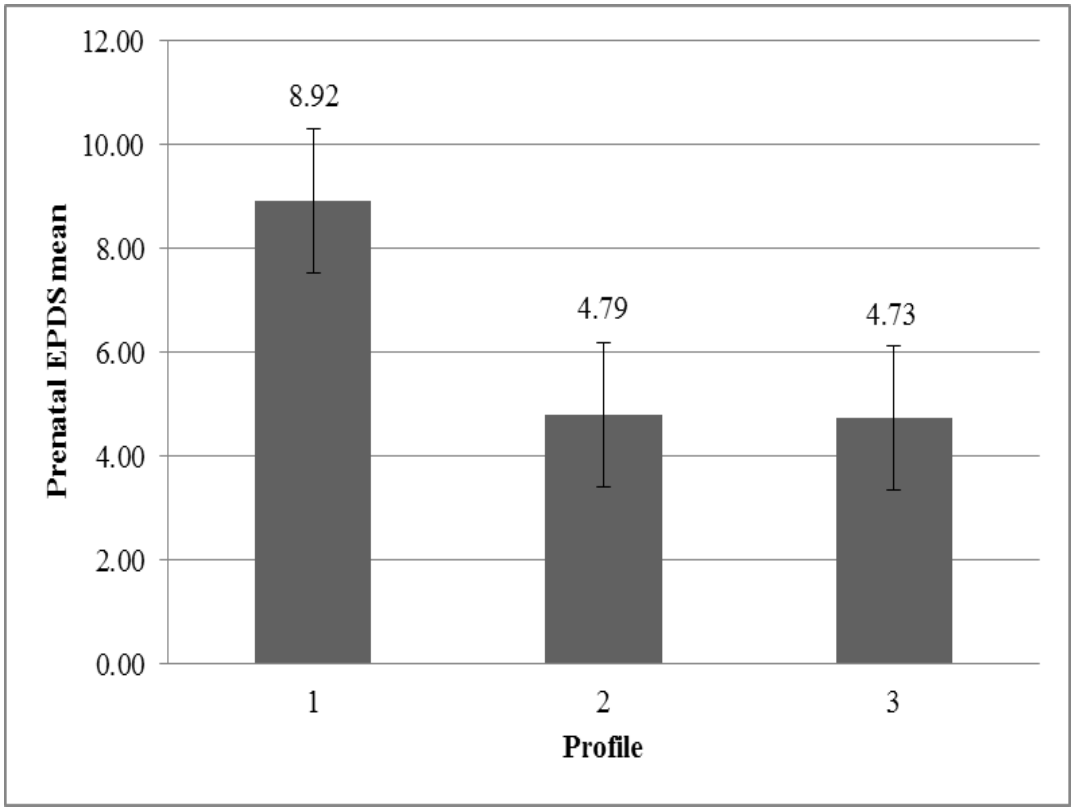


Figure 6

Profile mean differences for prenatal stress composite

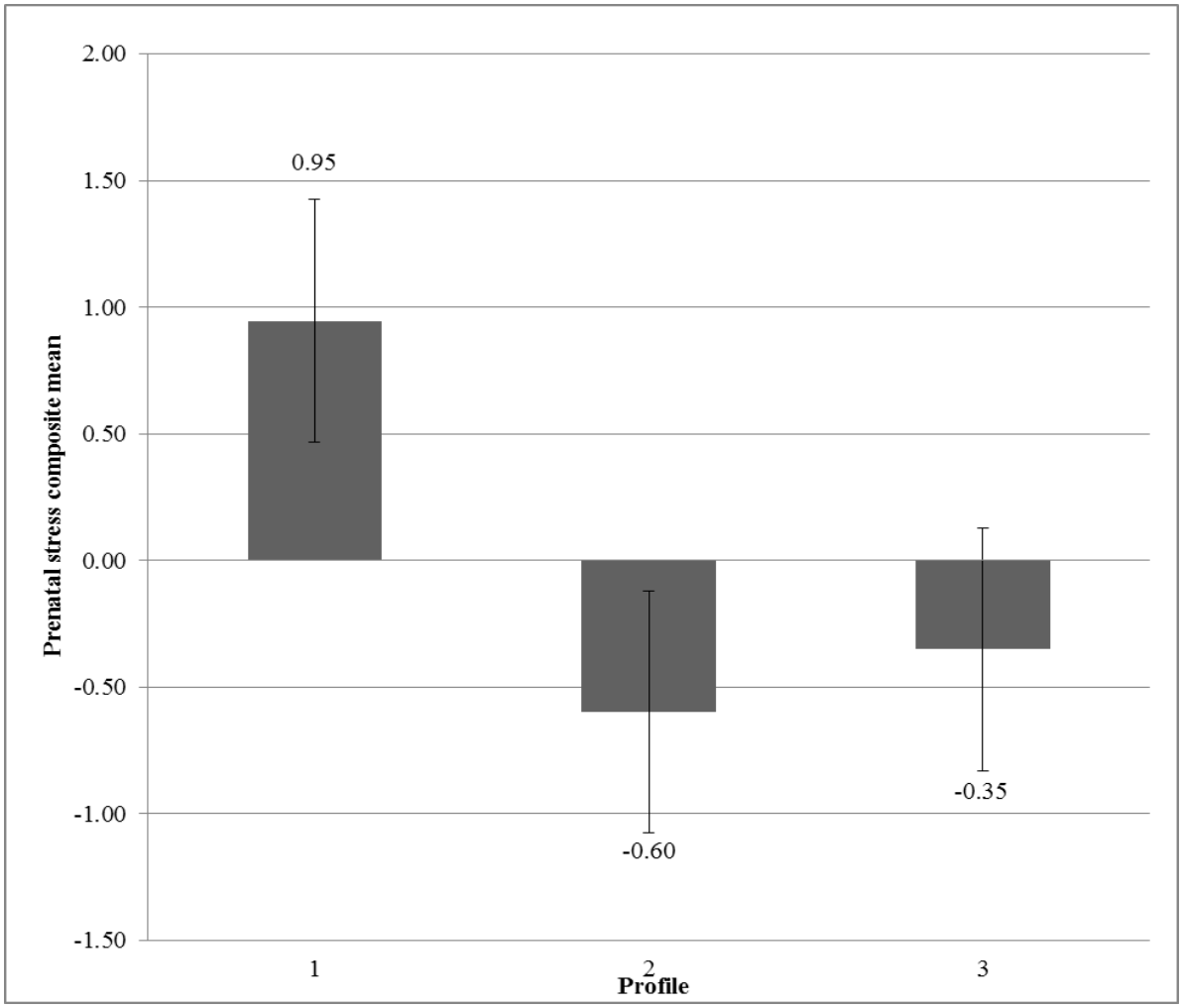


Figure 7

Profile mean differences for six week postpartum depressive symptoms (EPDS)

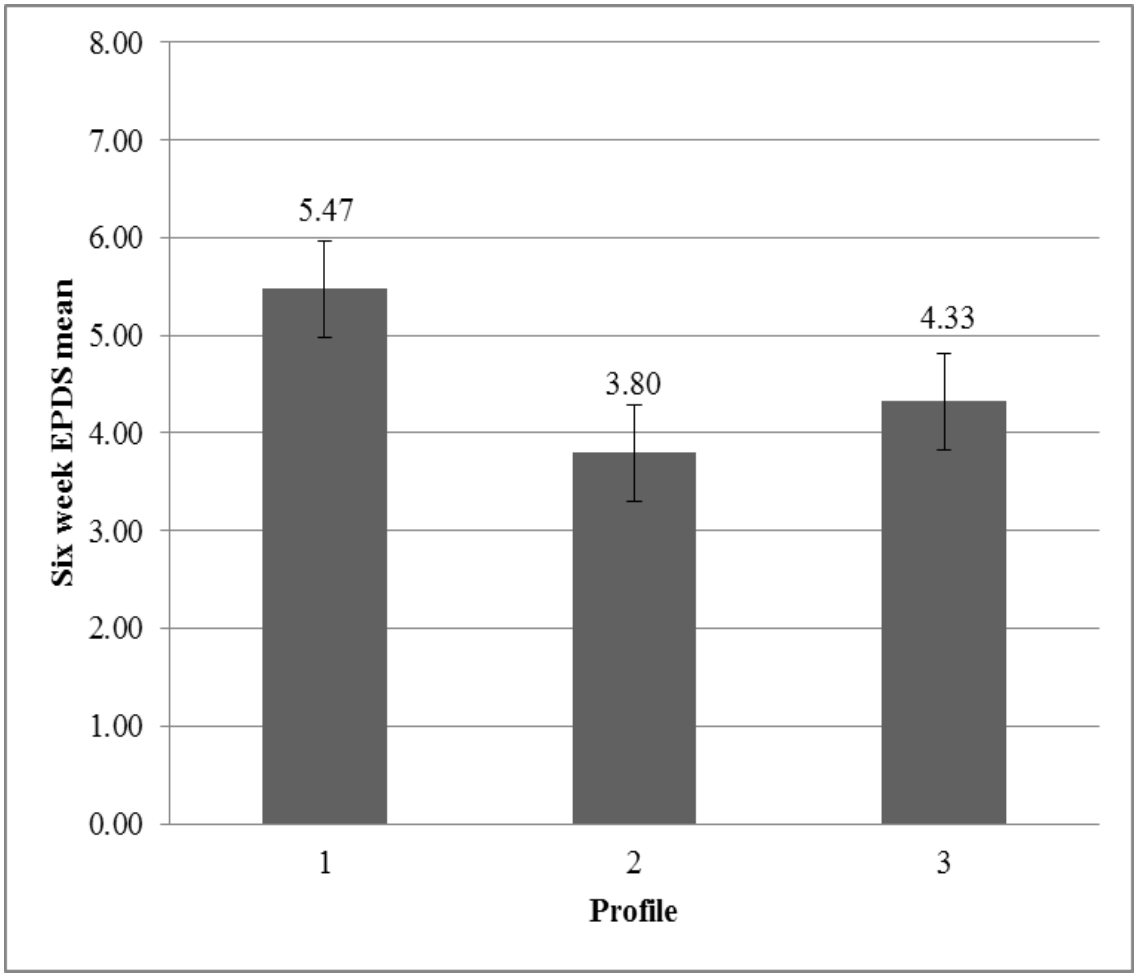


Figure 8

Moderation effects of profile group on prenatal economic stress and six week postpartum depressive symptoms

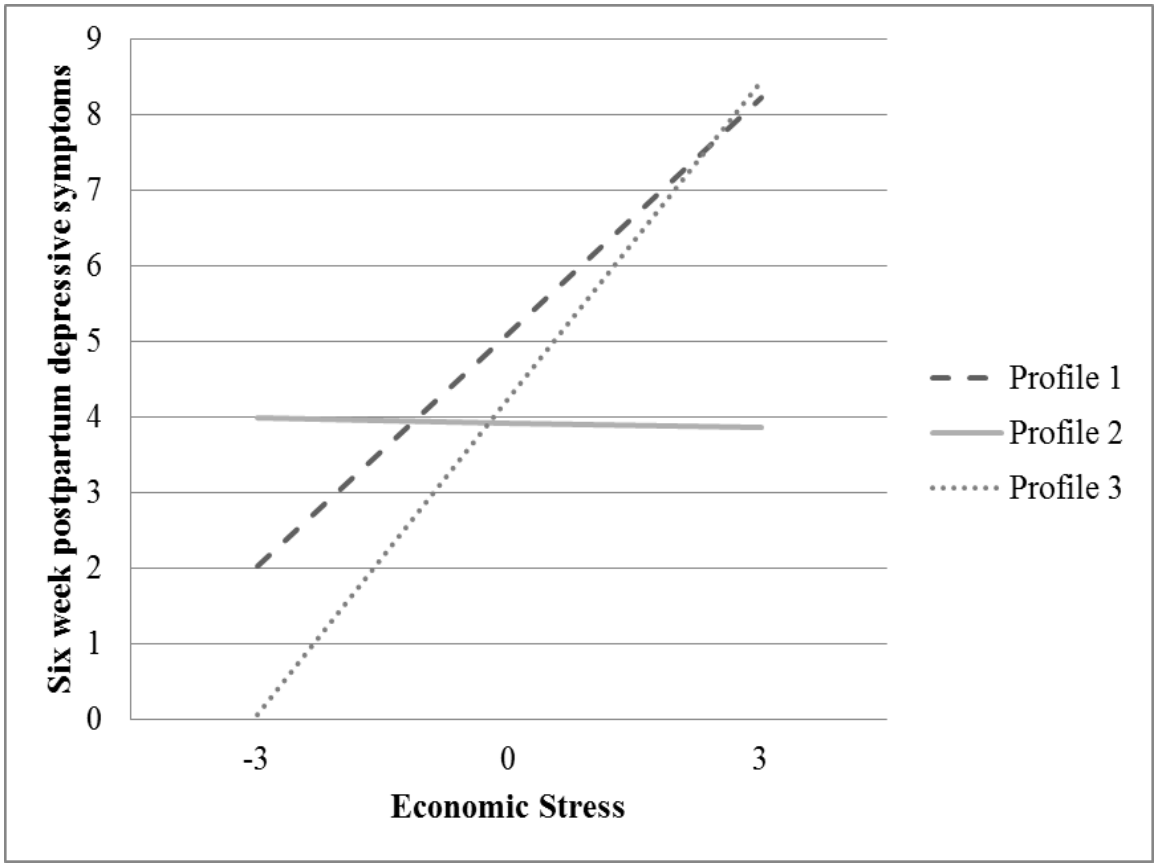


Figure 9

Profile mean differences for six week insomnia

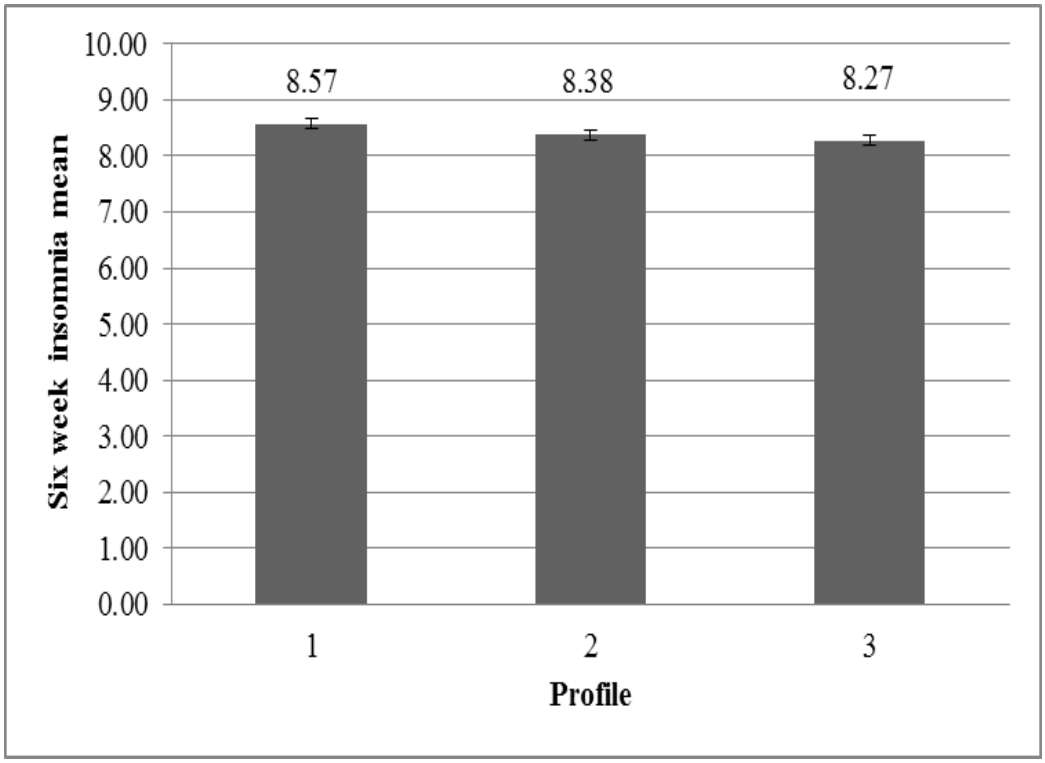


Figure 10

Profile mean differences for cortisol (Log AUCg) at six weeks postpartum

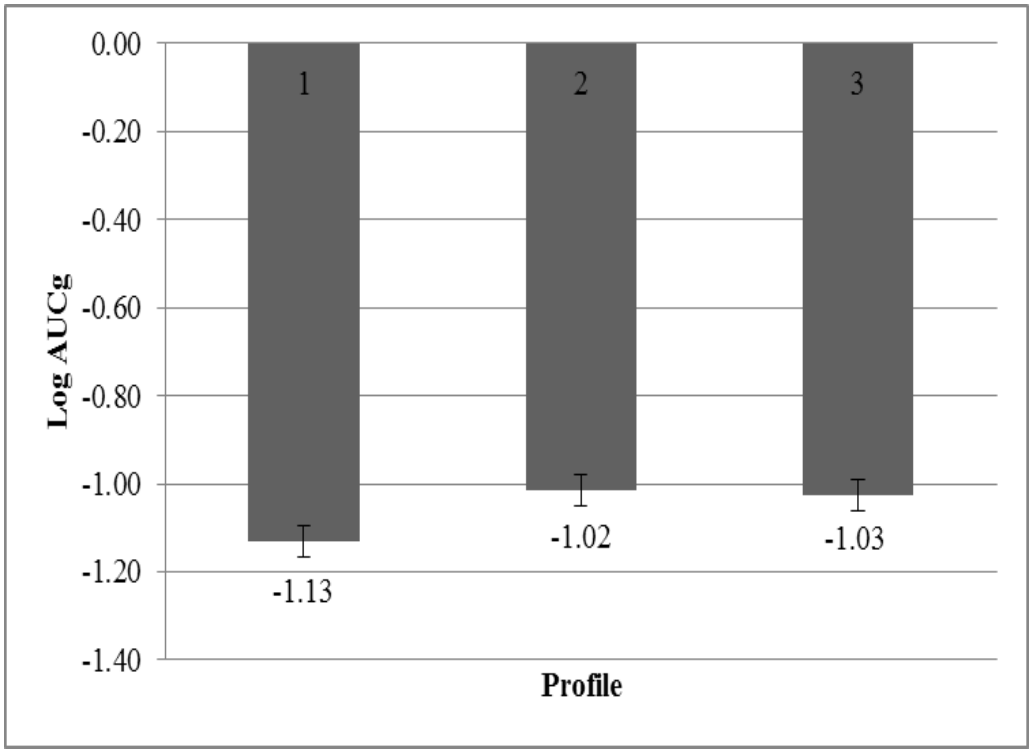


Figure 11

Profile mean differences for heart rate variability (HRV) at six weeks postpartum